EL-MOASSER

BIOLOGY

By A Group Of Supervisors

MAIN BOOK

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CONTENTS

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UNIT 1 Chemical Basis of Life

UNIT 2 Cell : Structure and Function

UNIT

1

Chemical Basis of Life

Objectives of the unit

By the end of this unit, the student should be able to :

- Determine the substances from which the living organisms' bodies are made up.
- Describe the molecular structure of carbohydrates, lipids, proteins and nucleic acids.
- Determine the functions of carbohydrates, lipids, proteins and nucleic acids.
- Explain the role of monosaccharides in the processes of production and transferring energy inside the cells of living organisms.
- Explain the relationship among the sequence of amino acids in the polypeptide chains, the structure and variation of the proteins.
- Identify carbohydrates, lipids and proteins practically.
- Explore the effect of the medium pH on the enzyme activity.
- Clarify the effect of temperature on the enzyme activity practically.
- Appreciate the grandeur of Allah for the accurate structure of living organisms' bodies.

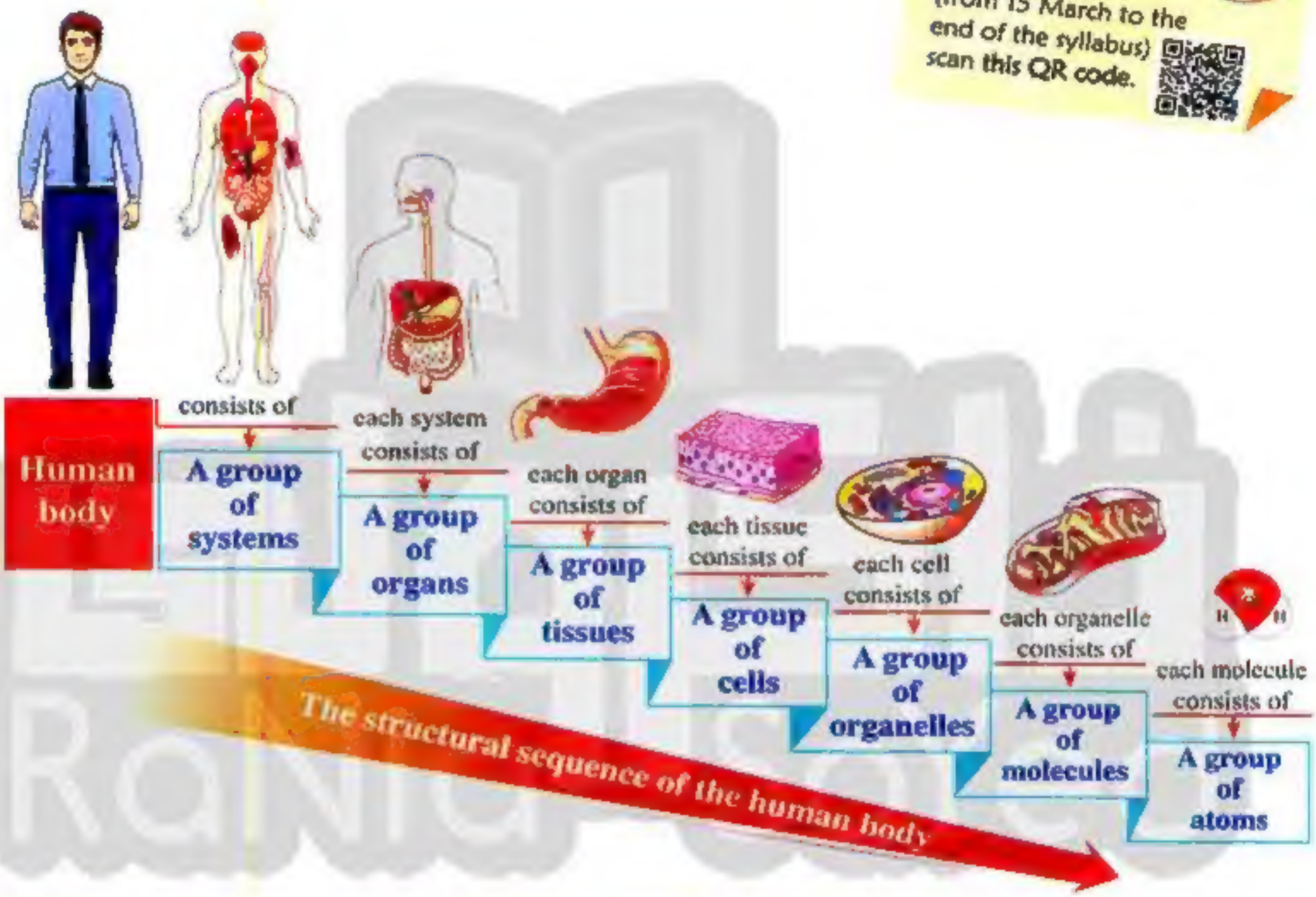
CHAPTER 1

Preliminary Lesson

Macro-molecules

★ **You know that the structure of higher living organisms' bodies, especially the human body, is represented by sequenced levels, as shown in the following figure :**

To access to the unstudied part of the previous year (from 15 March to the end of the syllabus) scan this QR code.



★ **By following this sequence, we find that the cells of the living organism are made up of :**

❶ Organic molecules

They are large-sized molecules that contain mainly carbon (C) and hydrogen (H) atoms and called "**biological macro-molecules**".

- Carbohydrates.
- Proteins.
- Lipids.
- Nucleic acids.

❷ Inorganic molecules

They are molecules that often don't contain carbon (C) atoms.

Examples

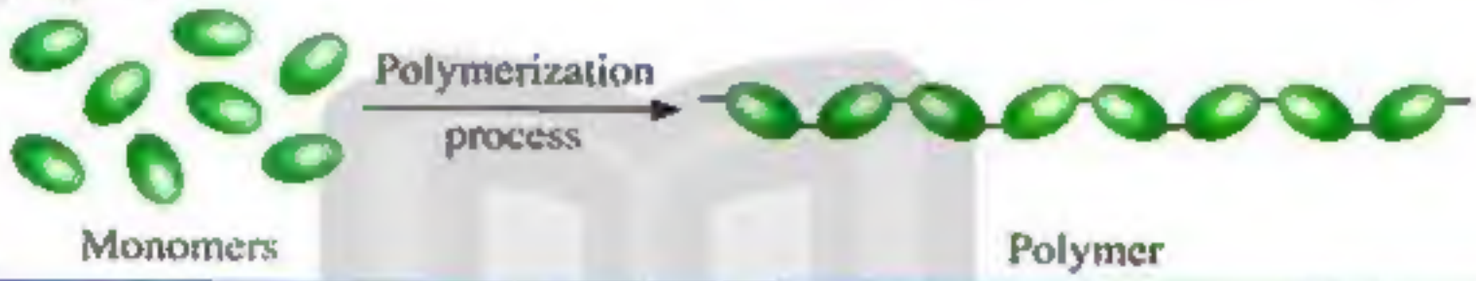
- Water (H_2O).
- Mineral salts (e.g. NaCl).

Biological macro-molecules

- They are large-sized organic compounds that are made up of smaller molecules.
- All of them contain carbon element.
- They are extremely necessary for the life of the living organisms.

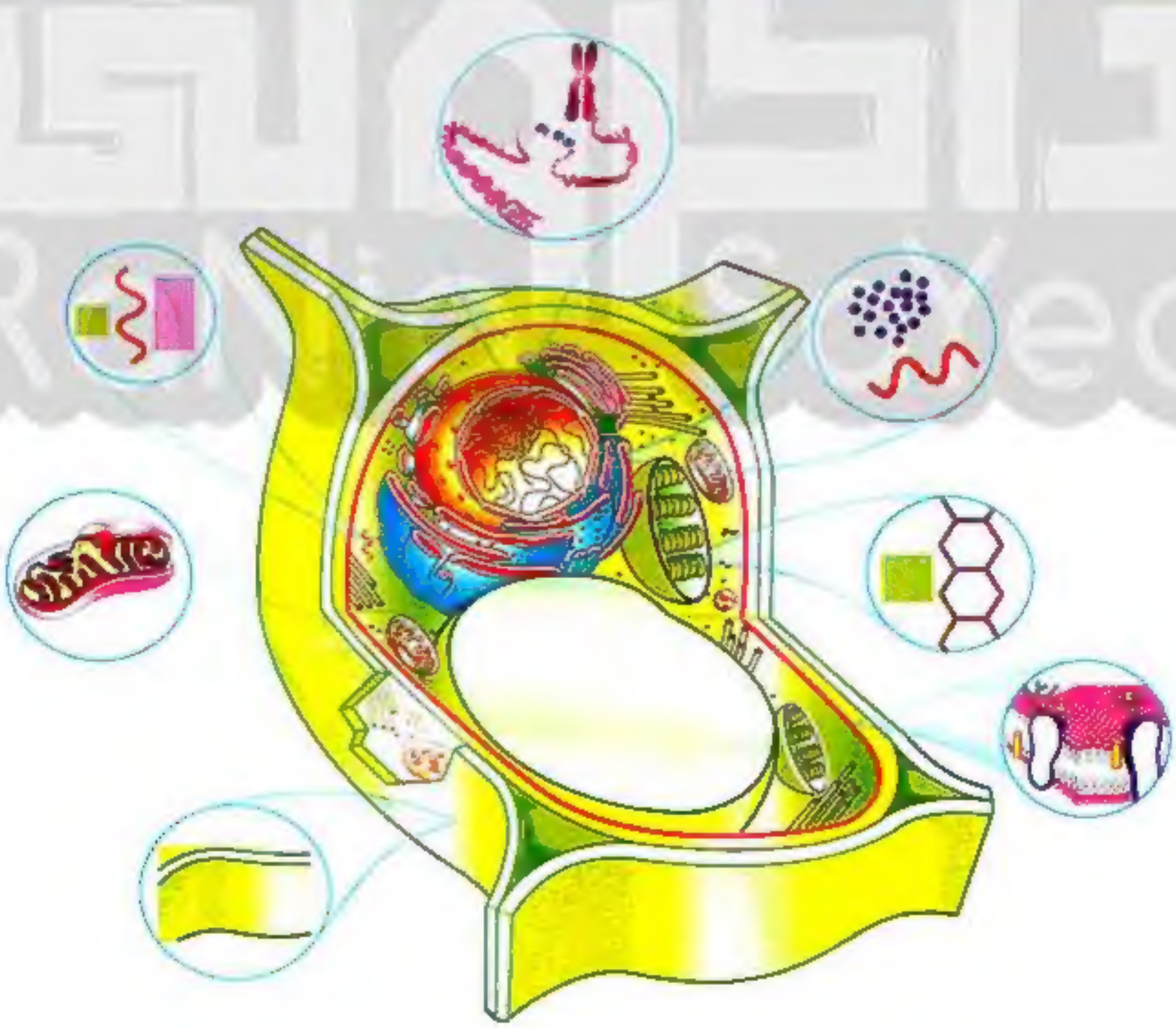
Note

- Most of macro-molecules are called **polymers** that are formed by the combination of small-sized molecules called **monomers** through the polymerization process, as shown in the following figure :



- They are classified according to their molecular structure and the functions that they perform into **four groups, which are :**

1 Carbohydrates **2 Lipids** **3 Proteins** **4 Nucleic acids (RNA / DNA)**



UNIT 1

- Each group consists of smaller molecules, as shown in the following figures :

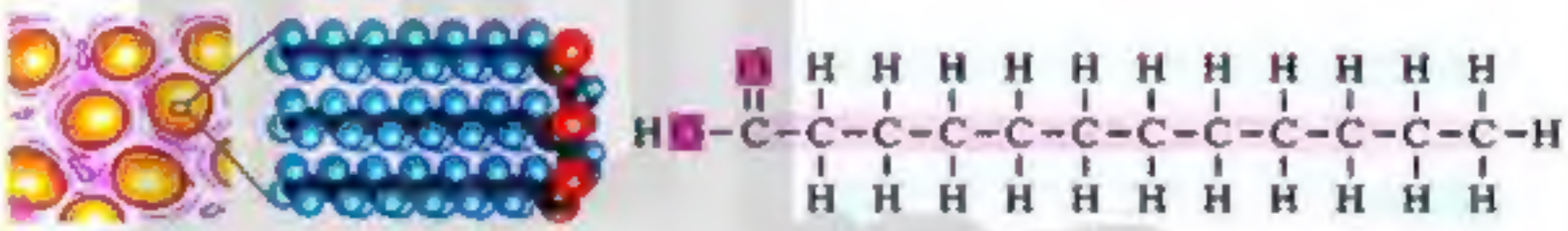
1 Carbohydrates

Chloroplast Starch Monosaccharide

The chloroplast contains starch which consists of monosaccharides.

2 Lipids

Fat cells Fats Fatty acid



Fat cells contain fats that consist of fatty acids.

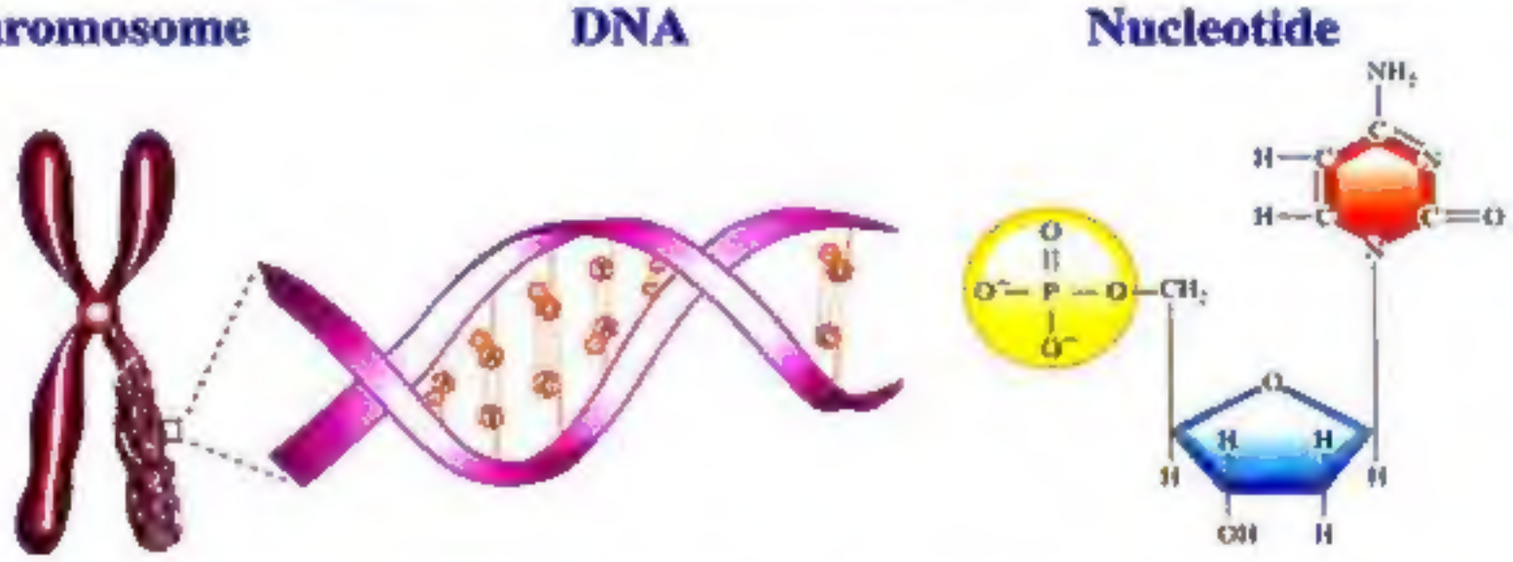
3 Proteins

Protein (Muscle) fiber Polypeptide Amino acid

Protein fiber consists of polypeptide that consists of amino acids.

4 Nucleic acids

Chromosome DNA Nucleotide



Chromosome contains DNA that consists of nucleotides.

In the following lessons, we will study each of these groups in details.

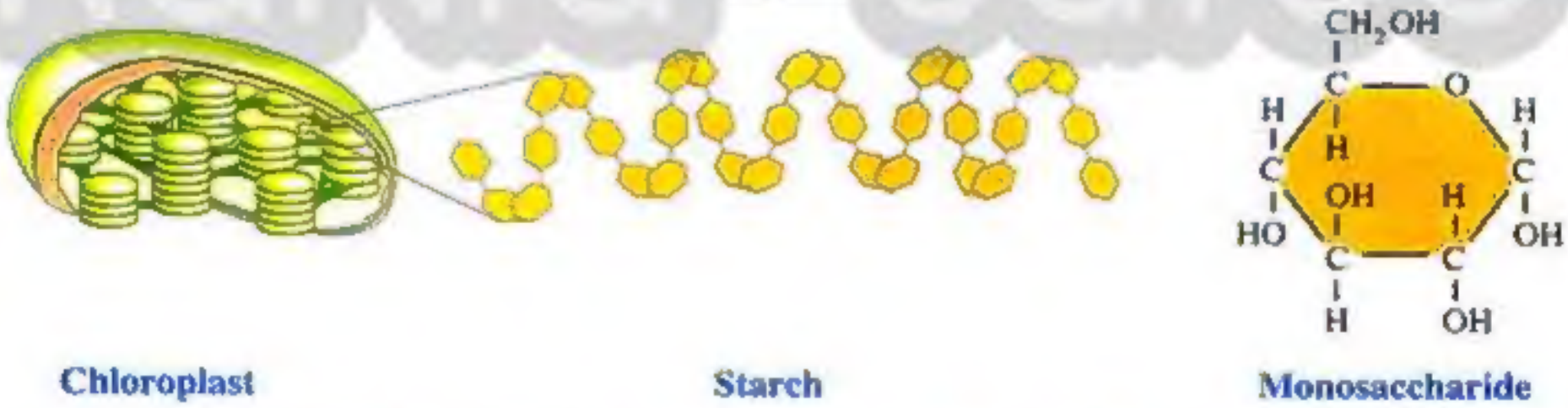
CHAPTER 1

LESSON ONE

Carbohydrates

Carbohydrates

- They are biological macro-molecules (polymers) that are made up of many smaller molecules (monomers) called monosaccharides (the simplest type of carbohydrates).
- They include each of the sugars, starches and fibers.
- **General formula of carbohydrates (monosaccharides) :** $(CH_2O)_n$, this formula shown that : Carbohydrates are made up of carbon (C), hydrogen (H) and oxygen (O) atoms with a ratio (1 : 2 : 1) respectively.



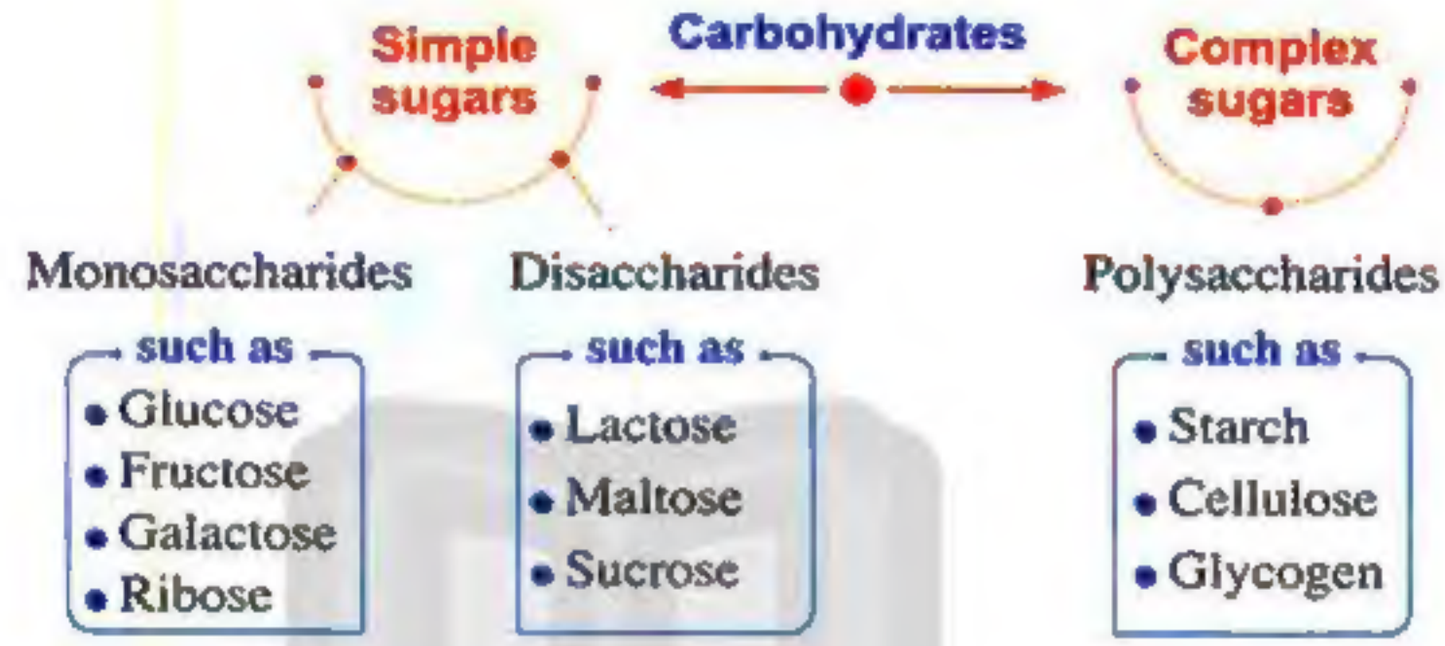
Chloroplast Starch Monosaccharide

The chloroplast contains starch which is made up of monosaccharides

UNIT 1

Classification of carbohydrates

- **Carbohydrates are classified, according to their molecular structure, as follows :**



1 Simple Sugars

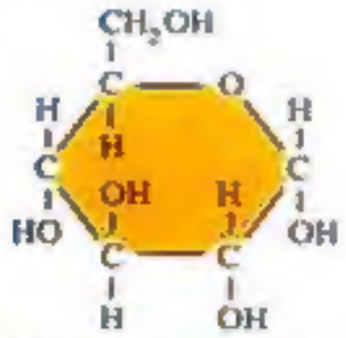
- **Their properties :**

- Soluble in water. - Having a low molecular weight. - Having often a sweet taste.

- **Their types :**

Monosaccharides	Disaccharides
Molecular structure	
They are made up of one molecule only which consists of a chain of carbon atoms (3 : 6 atoms), where each carbon atom is connected to oxygen and hydrogen atoms in a certain way. **Therefore**, monosaccharides are considered the simplest type of sugars.	They are made up of two molecules of monosaccharides linked together to form a disaccharide molecule. Monosaccharide + Monosaccharide → Disaccharide
Examples	
Glucose (Grape sugar). Fructose (Fruit sugar). Galactose. Ribose (Pentose sugar that enters in the structure of the nucleic acid RNA).	Lactose (Milk sugar) consists of Glucose molecule + Galactose molecule Maltose (Malt sugar) consists of Two glucose molecules Sucrose (Cane sugar) consists of Glucose molecule + Fructose molecule

For illustration only



Glucose molecule

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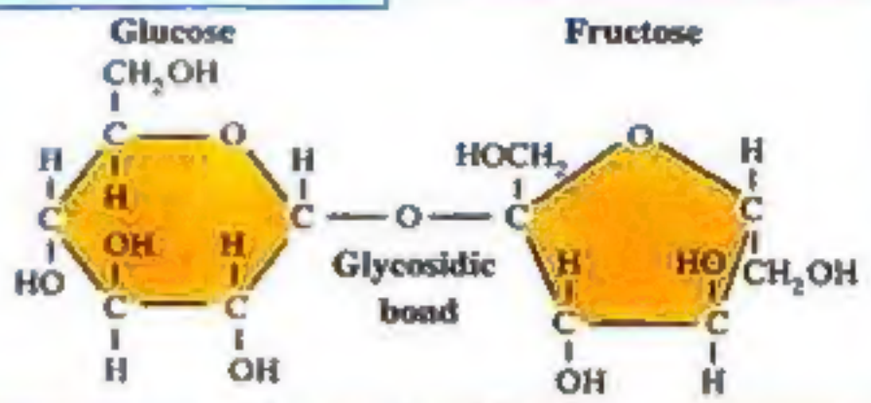


Sucrose molecule

Role of monosaccharides in energy production processes inside the living organisms' cells :

• **During glucose oxidation inside the cells in mitochondria, the following occurs :**

1. The stored energy in the chemical bonds that are present in glucose molecule is released to be stored in compounds called adenosine triphosphate (ATP).
2. Adenosine triphosphate (ATP) compounds are then transferred into other places in the cell to use the stored energy in them for performing all the vital processes inside the cell.

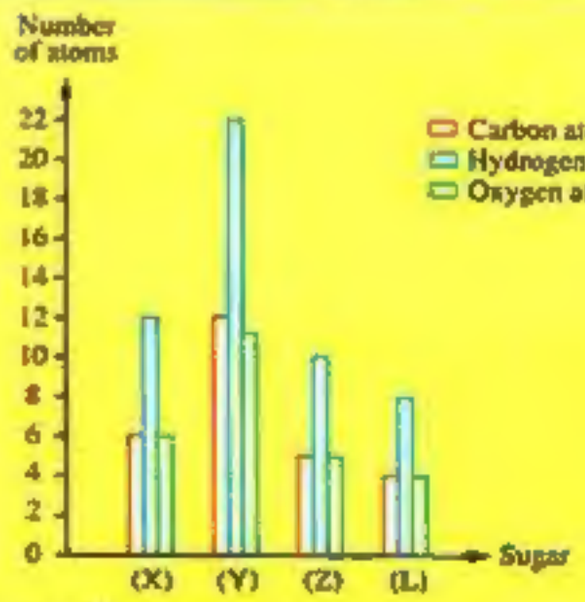
For illustration only

• *Monosaccharides are linked together by bonds called glycosidic bonds which are covalent bonds result in the formation of a water molecule, such as : the linkage of a glucose molecule with a fructose molecule to produce a sucrose molecule.*

Glucose molecule Fructose molecule Sucrose molecule

Test yourself

1 The opposite graph illustrates a number of carbon, hydrogen and oxygen atoms in a various group of carbohydrates, study it, then choose the correct answer :



(1) The ratio of carbon, oxygen and hydrogen atoms in sugar (L) is ..... respectively.

ⓐ 2 : 1 : 1 ⓑ 1 : 2 : 2

ⓒ 1 : 2 : 1 ⓓ 1 : 1 : 2

(2) Which of the following is considered a disaccharide sugar ? .....

ⓐ (X). ⓑ (Y). ⓒ (Z). ⓓ (L).

UNIT 1

(3) The sugar that enters in the structure of a nucleic acid in the living cell is .....
ⓐ (X). ⓑ (Y). ⓒ (Z). ⓓ (L).

(4) The sugar that is used by the cell in the energy production process inside the mitochondria is .....
ⓐ (X). ⓑ (Y). ⓒ (Z). ⓓ (L).

(5) The sugar that is found in the components of the mother's milk is .....
ⓐ (L). ⓑ (Y). ⓒ (Y) and (L). ⓓ (Z) and (L).

2 "Grape sugar is considered a source for obtaining energy in human".
Explain this statement.

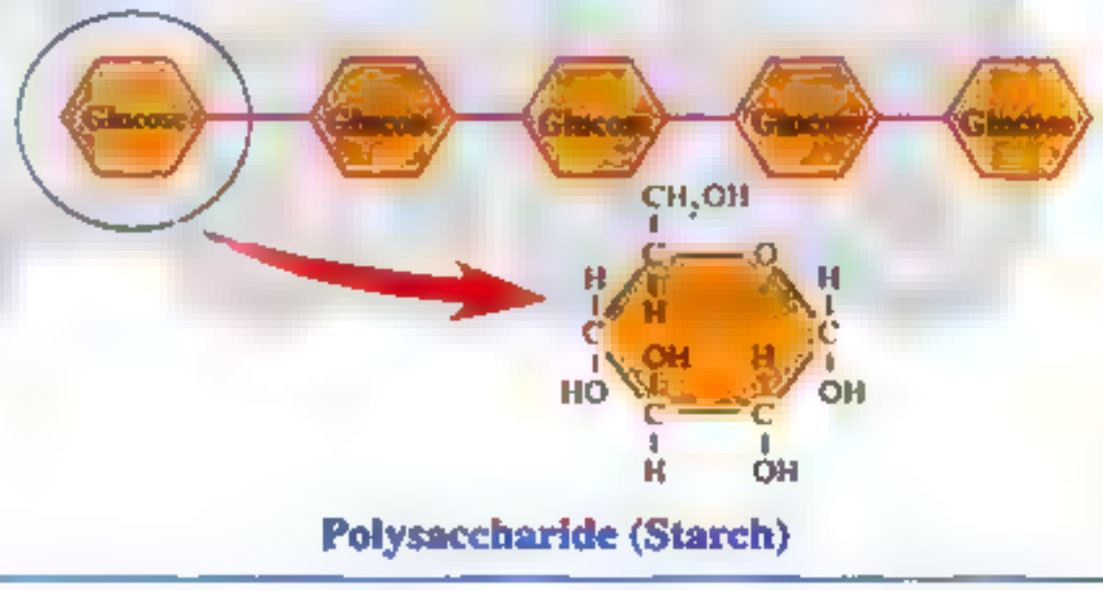
.....
.....
.....
.....

2 Complex sugars (Polysaccharides)

- **Their properties :**
  - Insoluble in water.
  - Don't have a sweet taste.
  - Having a high molecular weight.
- **Their molecular structure :**
  They are made up of many molecules of monosaccharides linked together.
- **Examples :**
  - Starch.
  - Cellulose.
  - Glycogen.

  (Each molecule of them consists of glucose molecules linked together by different ways).

For illustration only



Polysaccharide (Starch)

Test yourself

Choose the correct answer :

(1) The normal sequence for forming and producing energy inside the corn plant cells is .....
ⓐ ATP → glucose → starch → glucose. ⓑ starch → ATP → glucose → ATP
ⓒ glucose → starch → glucose → ATP ⓓ glucose → starch → ATP

(2) Starch is from the polysaccharides, and used in sweetening the beverages, ...
ⓐ the two statements are correct and related.
ⓑ the two statements are correct and unrelated.
ⓒ the first statement is correct and the second statement is wrong.
ⓓ the first statement is wrong and the second statement is correct.

(3) On the hydrolysis, all the following give symmetrical monomers, except .....
ⓐ sucrose. ⓑ glycogen. ⓒ starch. ⓓ maltose.

Importance of carbohydrates

1 **Obtaining energy :**	Carbohydrates are considered from the basic and fast sources for obtaining energy.
2 **Storing energy :**	• Carbohydrates are used for storing the energy in living organisms, until be needed, where : - Plants store carbohydrates in the form of **starch**. - Each of the human and animal stores carbohydrates in the form of **glycogen** in the cells of liver and muscles.
3 **Building cells :**	• Carbohydrates are considered a basic component of some parts of the cell, such as **cellulose** that enters in the structure of plant cell walls. • Carbohydrates enter in the structure of cell membranes and cell protoplasm.

Test yourself

1 Choose the correct answer :

(1) Carbohydrates are considered from the most important sources of energy in the living organism, because they .....
ⓐ contain energy that is higher than the other substances.
ⓑ are easily stored. ⓒ produce energy rapidly.
ⓓ can be produced by the cells.

(2) From the structural carbohydrates in the cells of some living organisms is(are) .....
ⓐ glycogen and cellulose. ⓑ starch and glycogen.
ⓒ starch only. ⓓ cellulose only.

2 "The cells of the human liver contain carbohydrates". **How far this statement is correct ? With explanation.**

.....

.....

UNIT 1

Practical Activity 1 Detection of monosaccharides

1. Used materials and tools :

- Water bath.
- 4 test tubes.
- Egg albumin.
- Pen.
- Burner.
- Glucose solution.
- Distilled water.
- Tube handler.
- Tube rack.
- Starch solution.
- Blue Benedict's reagent.

2. Procedures :

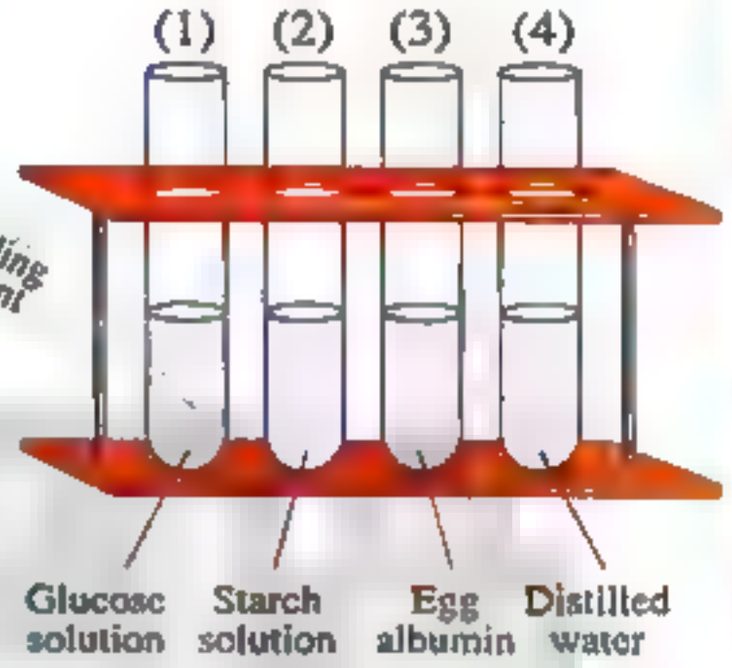
1 Label the test tubes from (1) : (4).

2 Put 2 mL of glucose solution, starch solution, egg albumin and distilled water respectively in the four tubes.

3 Add 2 mL of Benedict's reagent to each tube.

4 Place the tubes in water bath for 5 minutes, then turn off the burner.

After adding the reagent



3. Observations and explanations :

Tube no.	Substance	Observations	Explanations
(1)	Glucose solution.	Indicator's colour is changed into orange. (Positive result)	Indicator's colour in tube no. (1) is changed, because glucose is one of the monosaccharides that change the colour of Benedict's reagent from blue into orange.
(2)	Starch solution.	Indicator's colour doesn't change. (Negative result)	• Indicator's colour in the three tubes is not changed, because : - Starch is one of the complex sugars (polysaccharides) that don't change the colour of Benedict's reagent. - Egg albumin and distilled water don't contain any monosaccharides.
(3)	Egg albumin.		
(4)	Distilled water.		

4. Conclusion :

Benedict's reagent is used for detecting the monosaccharides (glucose) in various types of food.

Practical Activity 2 Detection of starch

1. Used materials and tools :

- Some food samples :
  - Soya beans.
  - Sugar.
  - Celery.
  - Tomato.
  - Macaroni.
  - Green apple.
  - Bread.
  - Pea seeds.
  - Wheat.
  - Carrot.
  - Milk powder.
- Iodine solution.
- Dropper.

Note

Some substances need to be grinded, such as soya beans, macaroni and wheat.

2. Procedure :

Detect the presence of starch in the previous samples by adding some drops of iodine solution to them.

3. Observations and explanations :

The orange colour of iodine solution turns into dark blue in the samples that are rich in starch, and remains without changing in the samples of food that don't contain starch.

Samples rich in starch	Samples have a little amount of starch		Samples don't contain starch	
• Macaroni. • Wheat. • Bread.	• Soya beans. • Pea seeds.	• Carrot. • Celery.	• Sugar. • Tomato.	• Green apple. • Milk powder.

Note

The degree of iodine solution's colour on adding it to food substances depends on the amount of starch in them.

4. Conclusion :

Iodine solution is used for detecting the presence of starch in various types of food.

Life application :

- ★ Blue Benedict's reagent is used for detecting the sugar in blood and urine.
- ★ Diabetic and obese patients must keep themselves away from eating sugary and starchy foods.

UNIT 1

Test yourself

Choose the correct answer :

(1) All the following don't change the colour of Benedict's reagent, except .....

ⓐ cellulose. ⓑ lactose. ⓐ glycogen. ⓓ glucose.

(2) On adding iodine solution to a sample of plant tissue of a corn plant leaf, which of the following possibilities represents the effect of the solution on each of the chloroplasts and cell wall ? .....

	Chloroplasts	Cell wall
ⓐ	Dark blue	Dark blue
ⓑ	Orange	Dark blue
ⓒ	Dark blue	Orange
ⓓ	Orange	Orange

CHAPTER 1

Questions on Preliminary Lesson & Lesson One

- **Macro-molecules.**
- **Carbohydrates.**

The questions signed by ✍ measure the high levels of thinking.

Interactive test

First Multiple Choice Questions

1 "All the mineral salts contain carbon atoms", "the mineral salts are considered organic molecules", ...

(a) the two statements are correct.
(b) the two statements are wrong.
(c) the first statement is correct and the second statement is wrong.
(d) the first statement is wrong and the second statement is correct.

2 "All the biological macro-molecules contain carbon element", "each chemical compound that contains carbon element is from the biological macro-molecules", ...

(a) the two statements are correct.
(b) the first statement is correct and the second statement is wrong.
(c) the first statement is wrong and the second statement is correct.
(d) the two statements are wrong.

3 In the chloroplasts during the photosynthesis process, a large number of glucose molecules is produced and stored through a process called .....

(a) oxidation. (b) reduction. (c) polymerization. (d) hydrolysis.

4 The monosaccharides contain .....

(a) 3 : 6 oxygen atoms. (b) 3 hydrogen atoms : 3 oxygen atoms.
(c) 3 : 6 hydrogen atoms. (d) 6 : 12 carbon atoms.

5 If you know that the number of hydrogen atoms in monosaccharide is (X), the number of carbon atoms equals .....

(a) $\frac{1}{2}X$ (b) X^2 (c) 2X (d) 3X

6 The number of oxygen atoms in ribose sugar is .....

(a) 5 (b) 6 (c) 10 (d) 12

7 Which of the following is considered a disaccharide sugar ? .....

(a) $C_3H_6O_3$ (b) $C_6H_{12}O_6$ (c) $C_{12}H_{22}O_{11}$ (d) $C_{18}H_{32}O_{16}$

UNIT 1

8 If you know that the binding between two glucose molecules is occurred by the removal of a water molecule, in the light of this, answer :

(1) What is the molecular formula of a polymer that consists of three glucose molecules ?

.....

ⓐ $C_{18}H_{36}O_{18}$ ⓑ $C_{18}H_{32}O_{16}$ ⓒ $C_{18}H_{30}O_{15}$ ⓓ $C_6H_{10}O_5$

(2) The formation of a polymer of ten monomers results in the production of ..... molecule(s) of water.

ⓐ 1 ⓑ 9 ⓒ 10 ⓓ 20

(3) The number of hydrogen and oxygen atoms that are removed on the formation of a polymer consisting of 5 monomers is .....

ⓐ 12 ⓑ 15 ⓒ 20 ⓓ 25

(4) The number of water molecules that are resulted from the formation of 5 maltose molecules is .....

ⓐ 9 ⓑ 5 ⓒ 4 ⓓ 1

---

9 The sugar molecule that contains 12 carbon atoms is .....

ⓐ sucrose. ⓑ glucose. ⓒ fructose. ⓓ galactose.

---

10 On the hydrolysis of 3 sucrose molecules, ... are produced.

ⓐ 6 molecules of grape sugar

ⓑ 3 molecules of grape sugar and 3 molecules of fruit sugar

ⓒ 3 molecules of grape sugar and 3 molecules of cane sugar

ⓓ 3 molecules of grape sugar and 3 molecules of malt sugar

---

11 On the hydrolysis of 20 molecules of maltose sugar, 10 molecules of lactose sugar and 10 molecules of sucrose sugar. So, the total number of glucose, fructose and galactose is ..... respectively.

ⓐ 40 / 20 / 10 ⓑ 50 / 10 /30 ⓒ 20 / 30 / 10 ⓓ 60 / 10 / 10

---

12 The normal sequence for the energy production inside the human body cells when drinking a cup of malt solution is .....

ⓐ starch ⟶ glucose ⟶ energy ⟶ ATP

ⓑ sucrose ⟶ glucose ⟶ energy ⟶ ATP

ⓒ maltose ⟶ glucose ⟶ energy ⟶ ATP

ⓓ lactose ⟶ glucose ⟶ ATP ⟶ energy.

---

13 The direct source of stored energy in ATP molecule that is required for the contraction of skeletal muscle is the .....

ⓐ protein. ⓑ glucose. ⓒ starch. ⓓ glycogen.

14 Muscles obtain the energy required for their contraction and relaxation on running or performing an effort from the .....

ⓐ starch. ⓑ glycogen. ⓒ mineral salts. ⓓ protein.

15 The direct storehouse of energy in muscles is .....

ⓐ starch. ⓑ glycogen. ⓒ glucose. ⓓ ATP

16 The opposite diagram illustrates chemical equations, where the symbols (A), (B) and (C) represent (6C) sugars. from your study of carbohydrates, answer the following questions :

$$A + A \xrightarrow[-H_2O]{\text{Enzyme}} (1)$$

$$A + B \xrightarrow[-H_2O]{\text{Enzyme}} (2)$$

$$A + C \xrightarrow[-H_2O]{\text{Enzyme}} (3)$$

(1) The sugar that is present in the barley grains is .....

ⓐ (1). ⓑ (2).

ⓒ (2) and (3). ⓓ (1) and (3).

(2) Which of the following statements is wrong ? .....

ⓐ The sugar (A) is mainly used to produce energy in most cells.

ⓑ The sugar (A) enters in the structure of disaccharides only.

ⓒ The sugars (A), (B) and (C) have the same molecular formula.

ⓓ The sugars (A), (B) and (C) have the same number of atoms.

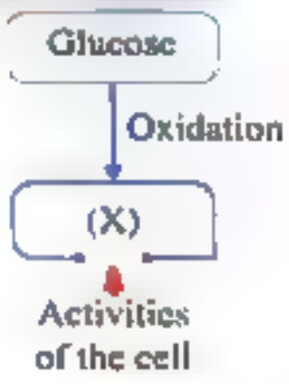
(3) The sugar that belongs to an animal origin may be .....

ⓐ (1) and (2). ⓑ (1) or (2). ⓒ (2) and (3). ⓓ (2) or (3).

17 By using the following figures, which choice represents the maltose sugar ? .....

ⓐ  ⓑ  ⓒ  ⓓ 

18 From the opposite figure which expresses a vital process that occurs inside the mitochondria, the letter (X) represents .....



ⓐ water. ⓑ starch.

ⓒ ATP ⓓ mineral salts.

19 After the digestion of bread, the excess of the human body need is stored in the form of .....

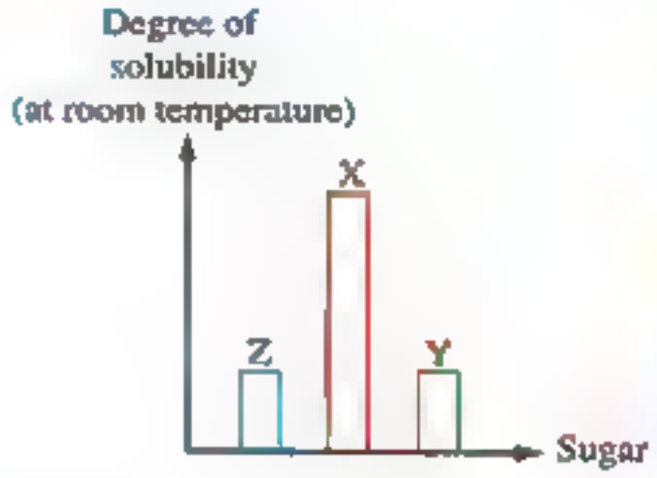
ⓐ cellulose. ⓑ glycogen. ⓒ starch. ⓓ glucose.

20 Which of the following expresses the chemical formula of starch ? .....

ⓐ $(C_5H_{10}O_5)_n$ ⓑ $(C_5H_{10}O_6)_n$ ⓒ $(C_6H_{10}O_5)_n$ ⓓ $(C_6H_{12}O_6)_n$

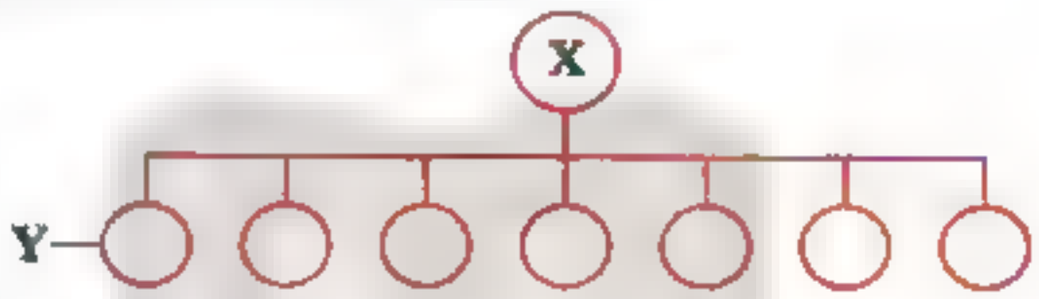
UNIT 1

21 In the opposite figure, the compound (X) is .....



(a) starch.
(b) cellulose.
(c) glycogen.
(d) sucrose.

22 Study the following figure, then determine :



Which statement expresses it perfectly ? .....

(a) The part (Y) has a molecular weight bigger than the part (X).
(b) The part (X) is resulted from the oxidation reaction.
(c) The part (Y) has the same properties of the part (X).
(d) The part (X) is resulted from polymerization process.

23 From the equation : ATP $\xrightarrow[\text{storage of energy}]{\text{release of energy}}$ ADP + P

What is the correct sequence for the pathway of energy in a plant cell ? .....

(a) Glycogen – Glucose – ATP – Energy.
(b) Glucose – Starch – ATP – Energy.
(c) Energy – Glucose – ATP – Energy.
(d) Glucose – Energy – ATP – Energy.

24 To limit the increase of weight, it is advised to reduce eating .....

(a) carbohydrates. (b) vitamins. (c) mineral salts. (d) proteins.

25 Iodine solution gives a positive result with .....

(a) grape juice.
(b) wheat powder.
(c) cane sugar juice.
(d) malt powder.

Second Miscellaneous Questions

I "All the molecules that contain carbon atoms are considered biological macro-molecules". **How far this statement is correct ? With explanation.**

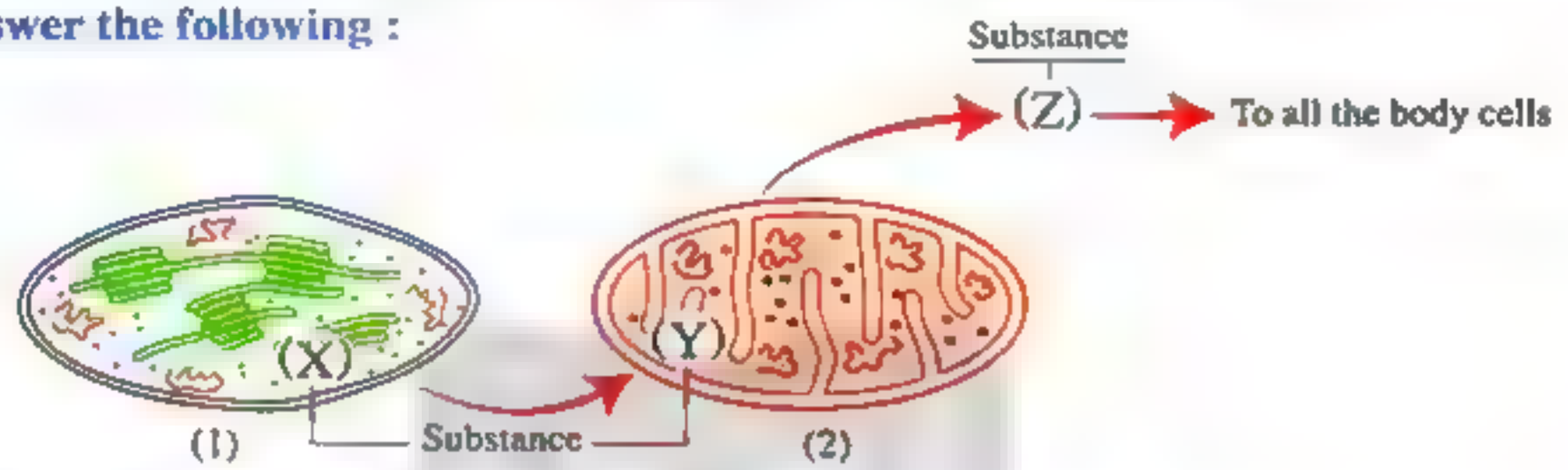
II **Mention the name of the molecule that results from the combination of grape sugar molecule with :**

(a) A molecule of fruit sugar.
(b) A molecule of grape sugar.

3 **What are the similarities and differences between :** water **and** glucose ?

4 **From the following diagram,** if you know that figure (A) represents a plastid storing starch in a potato tuber, figure (B) represents a mitochondrion in a muscular cell, and (X), (Y) and (Z) are substances used by the cells in the vital processes.

Answer the following :



(a) **What** do (Y) and (Z) substances represent ?

(b) **What** is the importance of substance (Z) ?

(c) **What** is the compound that results from the combination of many molecules of substance (Y) with each other in the animal ?

(d) **What are the similarities and differences between :** the substance (X) and substance (Y) ?

5 "Each of the starch and glycogen is considered a polymer of fructose sugar".
How far this statement is correct ? With explanation.

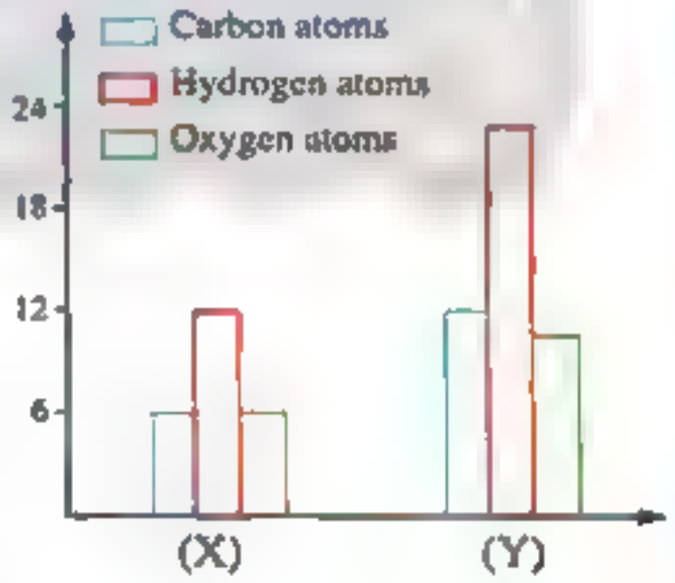
6 **The following graph shows a number of carbon, hydrogen and oxygen atoms in two organic compounds (X and Y), study it, then answer :**

(a) **What** does each of the two compounds (X) and (Y) represent ?

(b) If the compound (X) was a part of the compound (Y), **what is the compound (Y), when :**

1. It is present in the milk.
2. It is made up of similar molecules.
3. It is present in the cane sugar.

(c) **What happens if :** many molecules of compound (X) combine with each other inside the human body ?

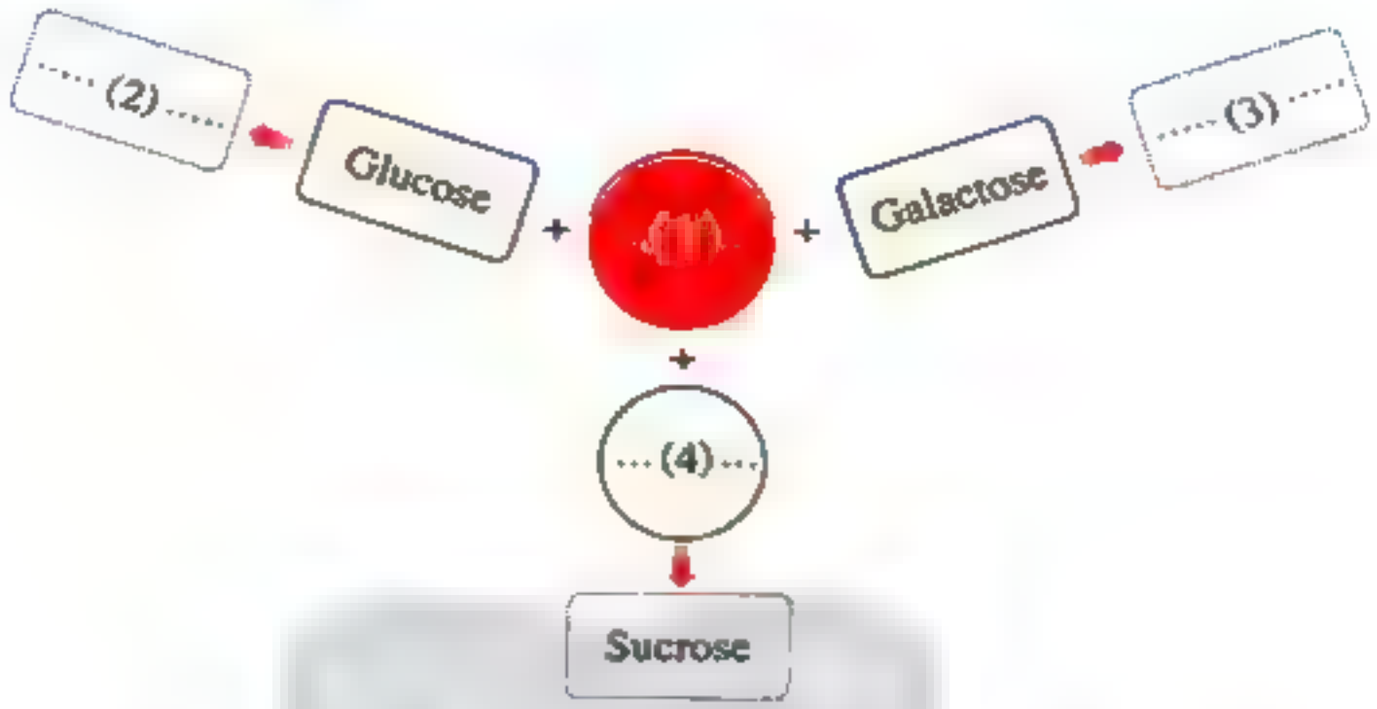


7 **What are the similarities and differences between :** glycogen **and** galactose ?

8 **What** is the name of the process in which two molecules of glucose sugar combine to form a molecule of maltose sugar ? **And to which** type the glucose sugar and maltose sugar belong ?

UNIT 1

9 **Complete the following diagram and mention the type of sugar :**

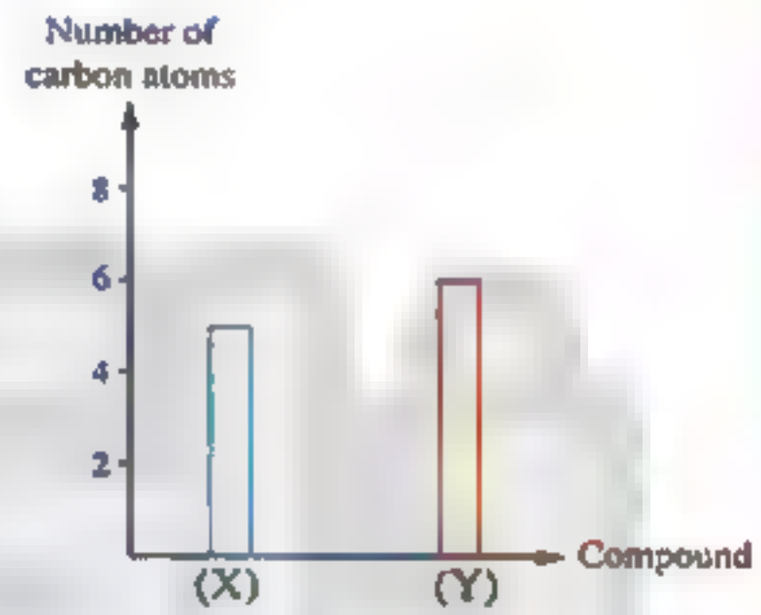


10 **The opposite graph shows a number of carbon atoms in two organic compounds (X) and (Y), study it, then answer :**

(a) What does the compound (X) represent ?
And where is it present ?

(b) What is the fate of compound (Y) in the cell of a plant leaf ?

(c) What is the molecular formula for each of (X) and (Y) ?



11 **Compare between :** glucose polymer in the plant **and** animal.

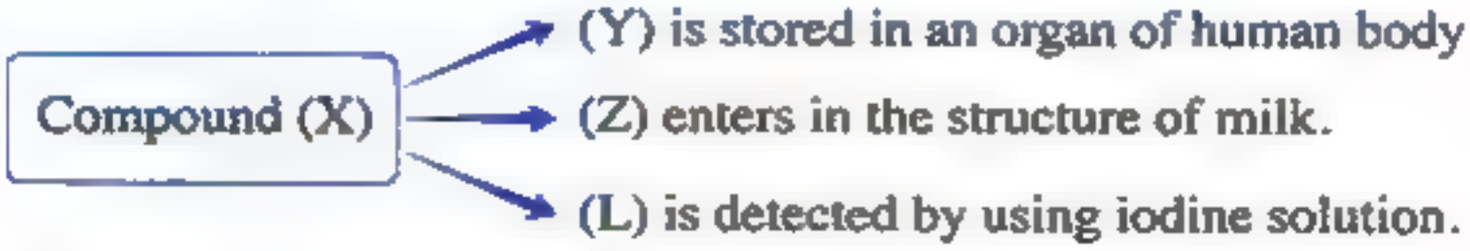
12 **The following diagram illustrates a sugar in plant, answer the following :**

(a) What does this diagram represent ? **And what** is its importance for the plant ?

(b) How does this diagram contribute in the production of energy inside the cell ?

13 "Adding drops of Benedict's reagent to malt solution gives a positive result".
How far this statement is correct ? With explanation.

14 **From the following diagram :**



Mention the letter and the name of compound that represents each of the following :

(a) Plant polymer.
(b) Animal polymer.
(c) Disaccharide.
(d) Monosaccharide.

15 **Give an example for each of the following :**

(a) A substance gives a positive result with Benedict's reagent and a negative result with iodine solution.

(b) A substance gives a positive result with iodine solution and a negative result with Benedict's reagent.

16 **What happens when :** adding Benedict's reagent to the wheat powder ?

17 **What happens when :** adding the iodine solution to the grinding rice ?

18 **The following table illustrates the results of an experiment that was carried out on 3 different solutions :**

	Solution (X)	Solution (Y)	Solution (Z)
Benedict's reagent	Orange	Blue	Blue
Iodine solution	Orange	Orange	Blue

In the light of this, answer the following :

(a) **Which** of the solutions is not considered from carbohydrates ?

(b) **Which** of the solutions is a glucose sugar ?

(c) **Which** of the solutions is a starch solution ?

CHAPTER 1

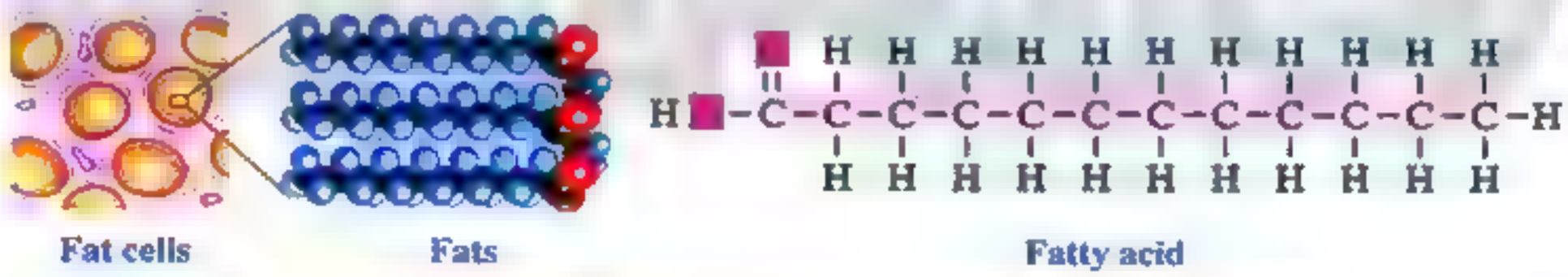
LESSON TWO

Lipids

Lipids

- They are biological macro-molecules (polymers) that are made up of many smaller molecules (monomers) called fatty acids, and consist of a large group of heterogeneous compounds, such as fats, oils, waxes, phospholipids and lipid derivatives.
- They consist of carbon (C), hydrogen (H) and oxygen (O) atoms.
- **The solubility of lipids :**

  Lipids are insoluble in polar solvents, such as water, but they are soluble in non-polar solvents, such as benzene and carbon tetrachloride.



Fat cells contain fats which are made up of fatty acids

Molecular structure of lipids

- **Lipids are formed by the union of :**
  - Three fatty acids.
  - One molecule of glycerol (an alcohol contains three hydroxyl groups $(OH)^-$).

For illustration only

Molecular structure of lipids

Classification of lipids

- Lipids are classified, according to their chemical structure, as follows :

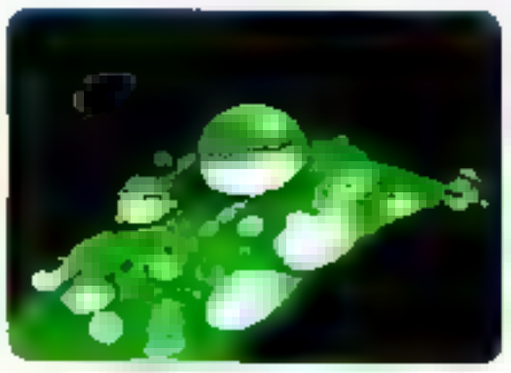
Lipids

- **Simple lipids** — divided into: Oils - Fats - Waxes
- **Complex lipids** — such as: Phospholipids
- **Lipid derivatives** — such as: Cholesterol - Some hormones

1 Simple lipids

- They are formed by the reaction of fatty acids with alcohols.
- **They are divided, according to :**
  - The saturation degree of fatty acids.
  - The type of alcohols.

As shown in the following table :

Lipid	Way of formation	Examples
1 Oils :	• Liquid fats (at ordinary temperatures). • Formed by the reaction of unsaturated fatty acids with glycerol.	• The oils that cover the feathers of aquatic birds to prevent water from penetrating into their bodies and hindering their movement.  Feathers of aquatic birds
2 Fats :	• Solid substances (at ordinary temperatures). • Formed by the reaction of saturated fatty acids with glycerol.	• Fats stored under the skin of some animals (as polar bear) to act as a thermal insulator for keeping their body temperature in the severe cold (polar) regions.  Polar bear
3 Waxes :	• Solid substances (at ordinary temperatures). • Formed by the reaction of high molecular weight fatty acids with monohydric alcohols (alcohols contain one hydroxyl group $(OH)^-$).	• The wax that covers the plant leaves, especially the desert plants, to reduce the water loss during transpiration process.  Wax covering the plant leaves

UNIT 1

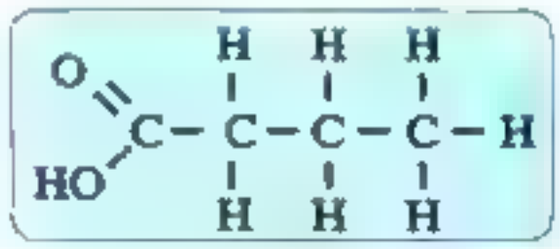
For illustration only

- ***Risks of the take-away food :***

Ready meals, fried food, many bakeries and sweets contain a type of fats called trans fats that are produced by the hydrogenation of vegetable oils. Frequently, eating these fats leads to the elevation of cholesterol concentration in blood.

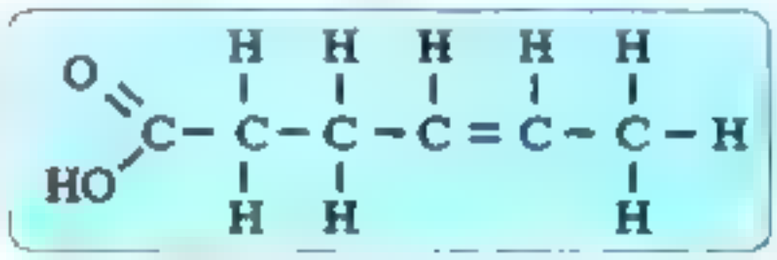
- ***There are two types of fatty acids :***

(1) Saturated fatty acids : *contain single covalent bonds only among the carbon atoms in the molecule of acid.*



Saturated fatty acid

(2) Unsaturated fatty acids : *contain single and double covalent bonds among the carbon atoms in the molecule of acid.*



Unsaturated fatty acid

Test yourself

1 **Choose the correct answer :** waxes and fats are similar in the .....

ⓐ number of (C), (O) and (H) atoms that are present in each of them.
ⓑ solubility in carbon tetrachloride.
ⓒ presence of three hydroxyl groups in their structure.
ⓓ presence of one hydroxyl group that enters in their structure.

2 When using oil for several times and cooling it, it changes from the liquid state to the solid state (i.e. the occurrence of hydrogenation process), **explain this in the light of your study of the chemical structure of lipids.**

.....

.....

3 "Food oil is soluble in benzene". **How far this statement is correct ? With explanation.**

.....

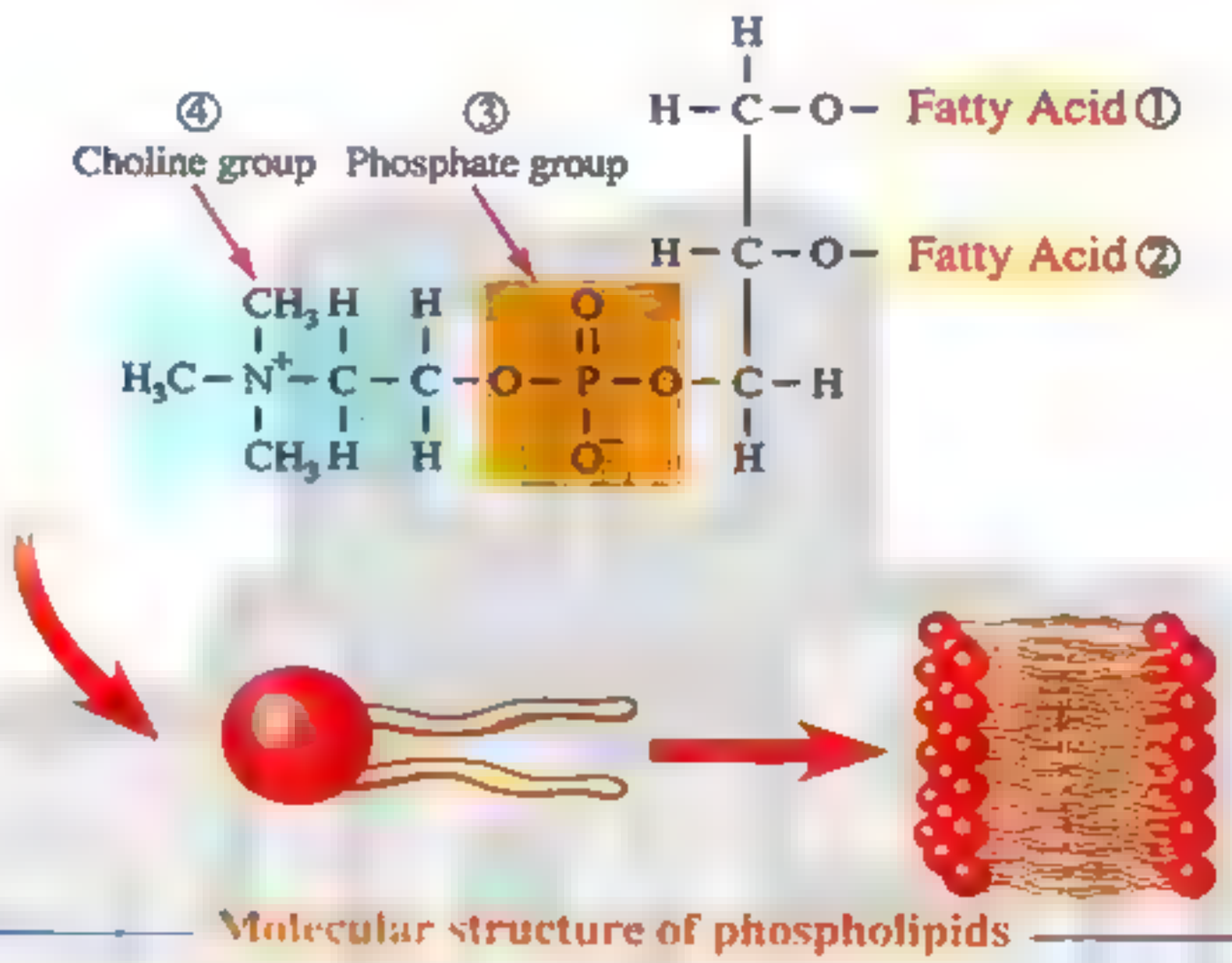
.....

2 Complex lipids

- **From their examples : phospholipids :**
  - Carbon (C), hydrogen (H), oxygen (O) are involved in their structure, in addition to phosphorus (P) and nitrogen (N).
  - They are present in the cell membranes of animal and plant cells.

- **Their molecular structure :** it is similar to the structure of fat molecules with replacing the third fatty acid in fats by a phosphate group and choline group.
  i.e. It consists of two fatty acids, glycerol molecule, phosphate group $(PO_4)^{-3}$ and choline group.

For illustration only



Molecular structure of phospholipids

3 Lipid derivatives

- They are derived from both of the simple and complex lipids by hydrolysis (a reaction occurs by adding water).
- **From their examples :**
  - Cholesterol.
  - Some hormones (as in steroids).

Importance of lipids

❶ **Obtaining energy :**	• Lipids (Fats) are considered an important source for obtaining energy, but the body doesn't begin to get the energy that is stored in fats, unless in case of the absence of carbohydrates. • The amount of energy gained from lipids is more than the amount of energy gained from the same quantity of carbohydrates.
❷ **Building cells :**	• Lipids represent about 5% of the organic materials that are involved in the composition of living cell. • Lipids (Phospholipids) are involved in the structure of the cell membranes (plasma membranes).

UNIT 1

3 **Work as a thermal insulator :**	Lipids (Fats) form insulating layers under the skin of human and some animals (as polar bear), therefore these animals can keep their body temperature in the severe cold regions.
4 **Work as a protective cover :**	Lipids (Waxes) cover the surfaces of several plants, especially the desert plants for reducing the water loss in transpiration process.
5 **Work as hormones :**	Some lipids work as hormones, as in steroids.

2 Test yourself

1 "Some individuals are characterized by the ability of their bodies to store energy in the form of large-sized molecules, leading to the obesity and sometimes to increasing the estrogen hormone which is from the steroids". In the light of this :

(a) Mention the type of stored biological macro-molecules. **Explain your answer.**

.....

(b) Write a site of storage of these molecules in the human body.

.....

(c) What are the medical advices you can recommend to these individuals ?

.....

.....

.....

2 Choose the correct answer :

(1) Phospholipids share with the molecules of fats in that they contain .....

ⓐ a phosphate group and choline group.

ⓑ a molecule of glycerol and saturated fatty acid.

ⓒ a phosphate group and a molecule of glycerol.

ⓓ a choline group and unsaturated fatty acid.

(2) The best arrangement for molecules according to the speed of obtaining energy from them is .....

ⓐ glycogen – sucrose – fats – glucose.

ⓑ fats – sucrose – glucose – glycogen.

ⓒ glucose – sucrose – glycogen – fats.

ⓓ glucose – sucrose – fats – glycogen.

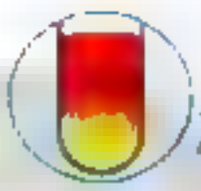
Practical Activity 3 Detection of lipids

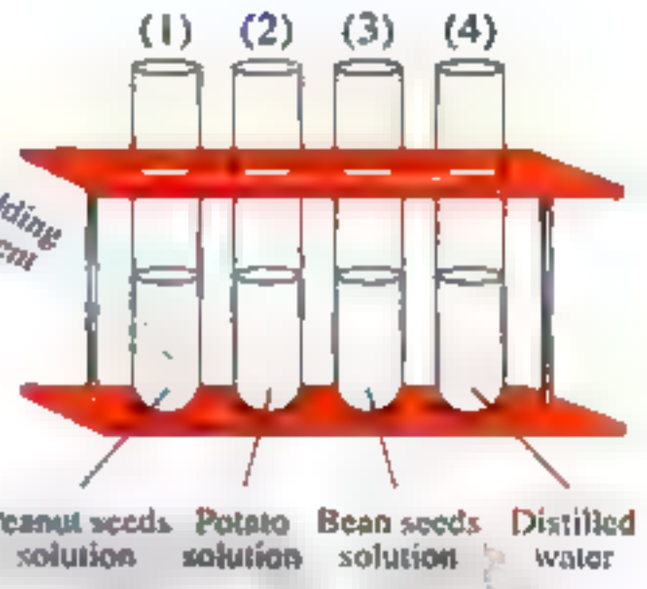
1. Used materials and tools :

- 4 test tubes.
- Potatoes.
- Bean seeds.
- Peanut seeds.
- Distilled water.
- Mortar.
- 4 pipettes.
- Sudan-4 reagent.
- Adhesive paper.
- Tube rack.

2. Procedures :

1. Cut a small piece of the potato into very smaller pieces, then grind them in the mortar with adding 2 mL of distilled water to facilitate this process. Repeat this step with both of bean and peanut seeds.
2. Numerate the tubes from (1) : (4).
3. In each of the four test tubes respectively, place 2 mL of peanut seeds solution, potato solution, bean seeds solution and distilled water.
4. Add 2 mL of Sudan-4 reagent to each tube.





3. Observations and explanations :

Tube no.	Material	Observations	Explanations
(1)	Peanut seeds solution.	The colour of the reagent turns into red. (Positive result)	The reagent's colour in tube no. (1) is changed, because peanut seeds contain fats in which the Sudan-4 reagent dissolves, leading to the change of its colour into red.
(2) (3) (4)	Potato solution. Bean seeds solution. Distilled water.	The reagent's colour doesn't change. (Negative result)	The reagent's colour doesn't change in the three tubes, because they don't contain fats.

4. Conclusion :

Sudan-4 reagent is used for detecting the fats in different foods.

UNIT 1

Life application :

Sudan-4 reagent is used to detect the fats in various foods, **such as** oils, milk and peanut butter, **because** it is a stain that is soluble in fats, where it turns into red colour in the presence of fats (lipids).

Test yourself

In lab, you have three unknown substances (1), (2) and (3), where you are asked to find out some information about them by using some available indicators which are (iodine – Sudan-4 reagent – Benedict's reagent) and after finishing the experiment, the results appeared as shown in the following table, study it, then answer :

Substance / Indicator	(1)	(2)	(3)
Iodine solution	–	–	+
Sudan-4 reagent	+	–	–
Benedict's reagent	–	+	–

–	Negative result
+	Positive result

1 Choose the correct answer :

(1) Which of the following represents the substances (1), (2) and (3) respectively ? .....

ⓐ Starch – glucose – fats. ⓑ Fats – glucose – starch.

ⓒ Fats – starch – glucose. ⓓ Glucose – fats – starch.

(2) Which of the following is considered the simplest organic molecule ? .....

ⓐ (1) only. ⓑ (2) only.

ⓒ (1) and (2) together. ⓓ (2) and (3) together.

2 Explain the reason for the appearance of positive result on adding Sudan-4 reagent to the substance (1).

.....

.....

CHAPTER 1

QUESTIONS ON LESSON Two

Lipids

The questions signed by ✓ measure the high levels of thinking.

Interactive test

First Multiple Choice Questions

1 All the following are soluble in benzene, except the .....
(a) waxes. (b) cholesterol. (c) steroids. (d) cellulose.

2 The classification of simple lipids depends on .....
(a) the type of alcohol only. (b) their physical properties.
(c) the saturation degree of fatty acids only. (d) (a) and (c) together.

3 Which of the following statements expresses a characteristic of fats ? .....
(a) They contain a less amount of energy than the cane sugar.
(b) They contain a greater amount of energy than the cane sugar.
(c) They are formed by a dehydration reaction.
(d) They consist of fatty acids, glycerol and a phosphate group.

4 Sunflower oil is present in a liquid state at room temperature, because it contains .....
(a) glycerol. (b) a certain type of fatty acids.
(c) water molecules. (d) carbon, hydrogen and oxygen elements.

5 ✓ If you know that the saturated fatty acids contain single covalent bonds only among the carbon atoms, while the unsaturated fatty acids contain single and double covalent bonds among the carbon atoms, according to this, answer the following questions :

(1) Which of the following is from the characteristics of oils ? .....
(a) They contain a greater number of hydrogen atoms than the fats.
(b) They contain a smaller number of hydrogen atoms than the fats.
(c) They are solid at room temperature.
(d) They are present in plants only.

(2) The oil differs from the fat in .....
(a) the presence of carbon and hydrogen.
(b) its commonness in the animal than the plant.
(c) its commonness in the plant than the animal.
(d) the type of alcohol that enters in its structure.

(3) The reason for the solid nature of fats is the .....
(a) increase of hydrogen atoms. (b) decrease of hydrogen atoms.
(c) presence of trihydric alcohols. (d) presence of monohydric alcohols.

UNIT 1

6 If you have a sample of lipids containing nearly 70% saturated fatty acids from its chemical composition, it is expected that this sample is ..... at room temperature.
(a) in solid state (b) in gaseous state
(c) in liquid state (d) converted into another state

7 The spiny fig plant is characterized by covering the upper epidermis with a substance which consists of .....
(a) saturated fatty acids and glycerol. (b) unsaturated fatty acids and glycerol.
(c) large-sized fatty acids and monohydric alcohols.
(d) large-sized fatty acids and glycerol.

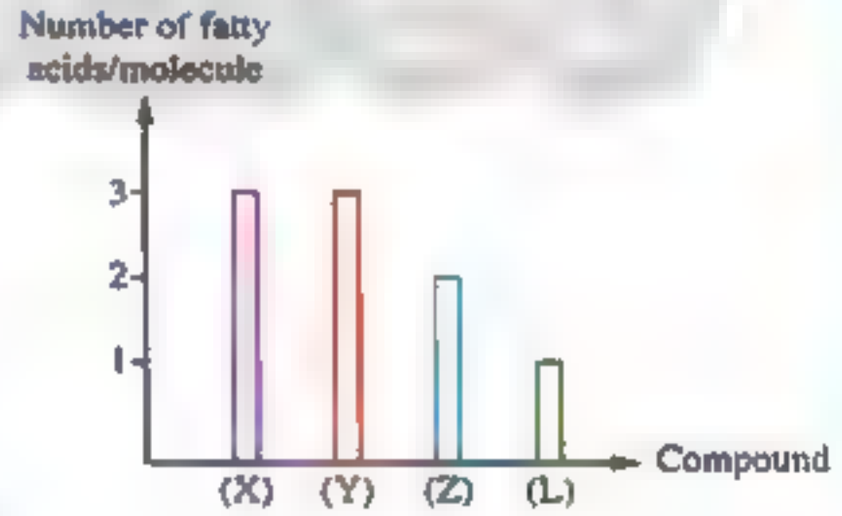
8 All the following biological molecules contain fatty acids and glycerol, except .....
(a) oils. (b) phospholipids. (c) waxes. (d) fats.

9 The number of fatty acids that are found in 10 molecules of phospholipids is .....
(a) 5 (b) 10 (c) 15 (d) 20

10 All the following are from the characteristics of steroids, except that .....
(a) they are from the large-sized organic molecules.
(b) carbon, hydrogen and oxygen elements enter in their structure.
(c) they are insoluble in water.
(d) they have a low molecular weight.

11 From the hormones that are considered lipids and have a role in the human sexual maturity is .....
(a) phospholipids. (b) steroids. (c) fats. (d) waxes.

12 The opposite graph shows compounds (X), (Y), (Z) and (L) that are insoluble in the polar solvents and soluble in carbon tetrachloride, study it, then answer :



(1) The compound that covers the surface of cactus is .....
(a) (X). (b) (Y).
(c) (Z). (d) (L).

(2) The compound that contains phosphorus element is .....
(a) (X). (b) (Y).
(c) (Z). (d) (L).

(3) The two compounds (X) and (Y) differ from each other in the .....
(a) solubility. (b) number of fatty acids.
(c) type of fatty acids. (d) type of alcohol.

(4) The two compounds (Y) and (Z) are similar in the .....

(a) structure. (b) number of fatty acids.

(c) type of alcohol. (d) presence of choline group.

---

13 The molecule whose chemical formula is ($C_{27}H_{45}OH$) could be .....

(a) glycogen. (b) phospholipid. (c) cholesterol. (d) starch.

---

14 All the following result from the hydrolysis of simple and complex lipids, except the .....

(a) cholesterol. (b) testosterone hormone.

(c) estrogen hormone. (d) phospholipids.

---

15 Lipids are characterized by always containing .....

(a) glycerol molecules. (b) fatty acids.

(c) choline groups. (d) phosphate groups.

---

16 A living cell needs energy equal (X) resulting from the oxidation of 5 g of glucose, and in order for the cell to get the same amount of energy in case of the absence of glucose, it uses an amount of fatty acids that equals about ..... g.

(a) 3 (b) 5 (c) 10 (d) 15

---

17 If you know that the complete oxidation of glucose molecule produces 38 ATP molecules, therefore the complete oxidation of a fatty acid molecule produces ..... ATP molecules.

(a) 28 (b) 30 (c) 38 (d) more than 38

---

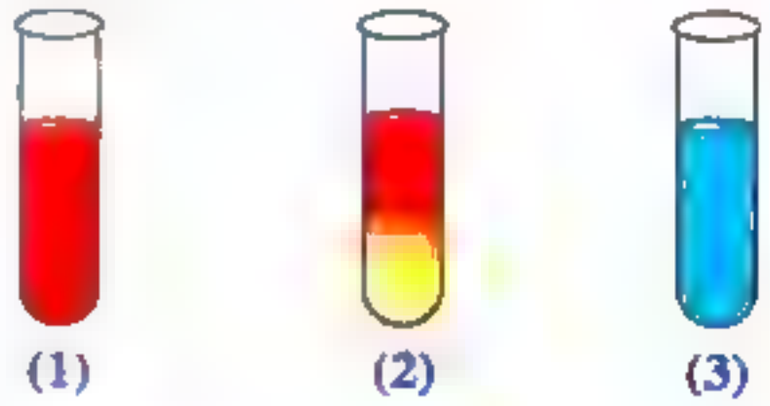
18 Which of the following is from the products of the digestion of peanut ? .....

(a) Amino acids and water. (b) Fatty acids and glycerol.

(c) Glucose and glycerol. (d) Water and glycerol.

---

19 The opposite tubes contain equal amounts of different compounds, where Sudan-4 reagent had been added to each tube, which of these tubes contain(s) a compound that produces the highest amount of energy ? .....



(a) (1). (b) (2).

(c) (3). (d) (2) and (3) together.

UNIT 1

Second Miscellaneous Questions

1 **Give reason for :** some wall's paintings are removed by using benzene.

2 Sometimes, the spots on clothes are cleaned up by using benzene, and sometimes without benzene. **Explain this.**

3 **The two following figures (1) and (2) have been put in Sun for 3 hours, what happens** to the amount of water in (1) and (2), after this period ? **With explanation.**

Figure (1) **Figure (2)**

4 **Compare between :** a substance that covers the cactus leaves **and** a substance that is stored under the human skin.

5 Lipids play an important role in maintaining the life of some animals and plants to adapt with the different environmental conditions, **explain this.**

6 **What are the similarities and differences between :** plant oil **and** animal fat ?

7 **(Fats / Phospholipids / Oils / Waxes), from the previous words :**

(a) If the odd word was "Phospholipids", **write what links the rest.**

(b) If the odd word was "Waxes", **write what links the rest.**

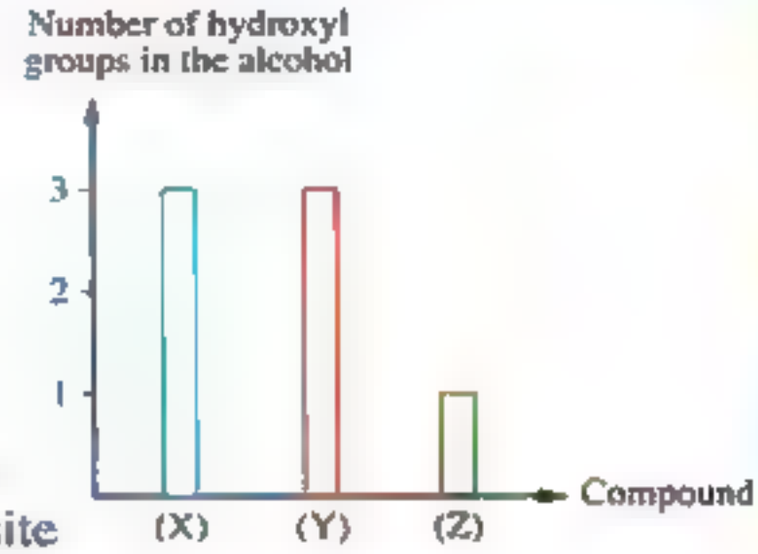
8 In front of you, some foods that are rich in lipids **(Sesame seeds – Cream – Olives – Full fat yogurt – Corn grains) :**

Classify these foods in the following table :

Foods contain saturated fatty acids	Foods contain unsaturated fatty acids
.....	.....
.....	.....

9 **Give reason for :** penguin can live in the polar regions, while hawk can't live in the same regions.

10 **The opposite graph illustrates a number of hydroxyl groups in the alcohols that enter in the structure of organic compounds (X), (Y) and (Z), if you know that (Y) and (Z) have the same physical state, while (X) differs from them, study the graph, then answer :**



(a) **Conclude** the name of compounds (X), (Y) and (Z), **then mention** the type and give an example for the site of each one of them through your study for the biological macro-molecules.

(b) **Explain :** the physical state of compound (X) differs from that of compound (Y).

---

11 "Cholesterol may be produced from phospholipids". **How far this statement is correct ? With explanation.**

---

12 **Compare between :** the organic compound that is stored in this figure **and** the organic compound that covers its surface, "**according to :** name – type of the compound – solubility".

---

13 **You ate a meal consisting of (vegetables salad – paste – boiled rice – boiled peas – orange) :**

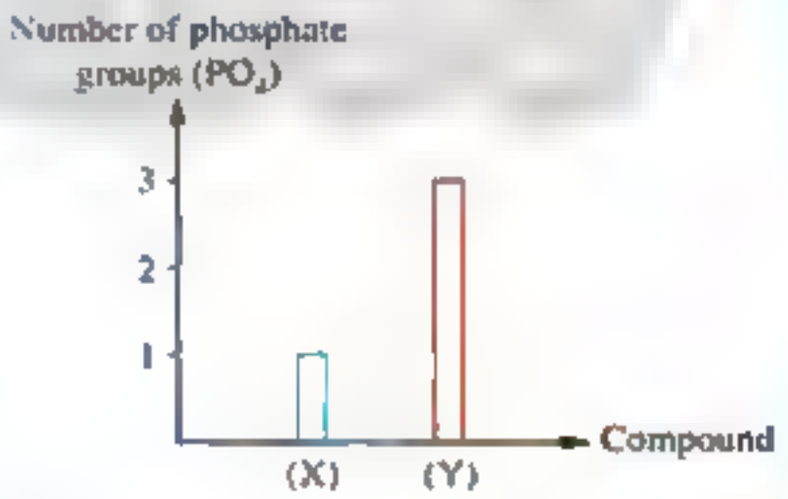
(a) **What** is the source of lipids in this meal ?

(b) **What** is the type of lipids in this meal ?

(c) **Does** this meal contain cholesterol ? **Explain your answer.**

---

14 **The opposite graph illustrates the number of phosphate groups (PO_4) in two compounds (X) and (Y) in a cell, determine the letter and the name of the compound that :**



(a) Represents the unit of energy store in the cell.

(b) Represents a lipid which enters in the structure of a part of the cell.

---

15 **What are the similarities and differences between :** steroids **and** cellulose ?

---

16 **Choose the anomalous word, then mention what links the rest :**

Cholesterol / Phospholipids / Testosterone hormone / Progesterone hormone.

---

17 To decrease the weight (the obesity treatment), it is advised to decrease eating high-fat diets, **explain this.**

UNIT 1

18 **What happens when :** consuming most of the glucose and glycogen in the human body, when performing a vigorous effort ?

19 **Mention the name and the type of lipid that is present in each of the following :**

(a)

(b)

(c)

20 **Compare between :** the fast source of energy in the body **and** the delayed source of energy in the body, "**according to :** name – building unit – types".

21 "The amount of energy that the body gained, on digesting 3 g of animal fats equals the amount of energy that the body gained, on digesting 3 g of rice".
How far this statement is correct ? With explanation.

22 "The reduction of eating carbohydrates in food helps in getting rid of the fats stored in the body". **How far this statement is correct ? With explanation.**

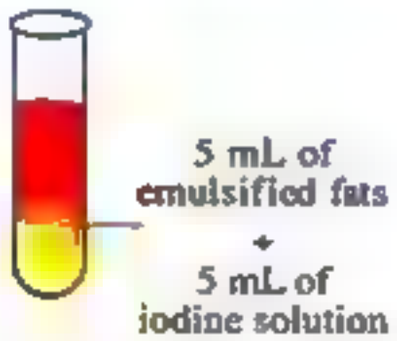
23 **Three complex compounds (X), (Y) and (Z) :**

- The compound (X) is present in the plant cell wall, and consists of a large number of glucose molecules.
- The compound (Y) is present in the cell membrane, and enters in its structure the elements (C, H, O, P & N).
- The compound (Z) is present in the muscles and liver cells of human, and consists of a large number of glucose molecules.

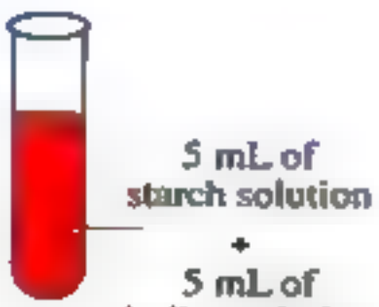
What is the name of each compound ? **And what** is the name of the biological macro-molecules to which each compound belongs ?

24 **Write what this statement indicates :** "A substance gives red colour with the solution of sesame powder".

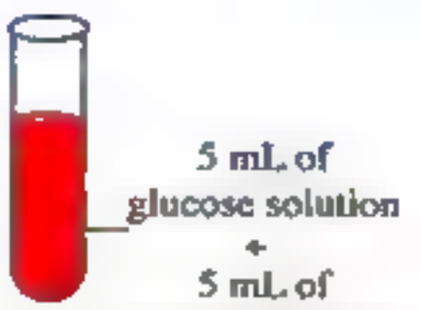
25 **Determine the mistakes that are present in the following figures, then correct them :**



(1)

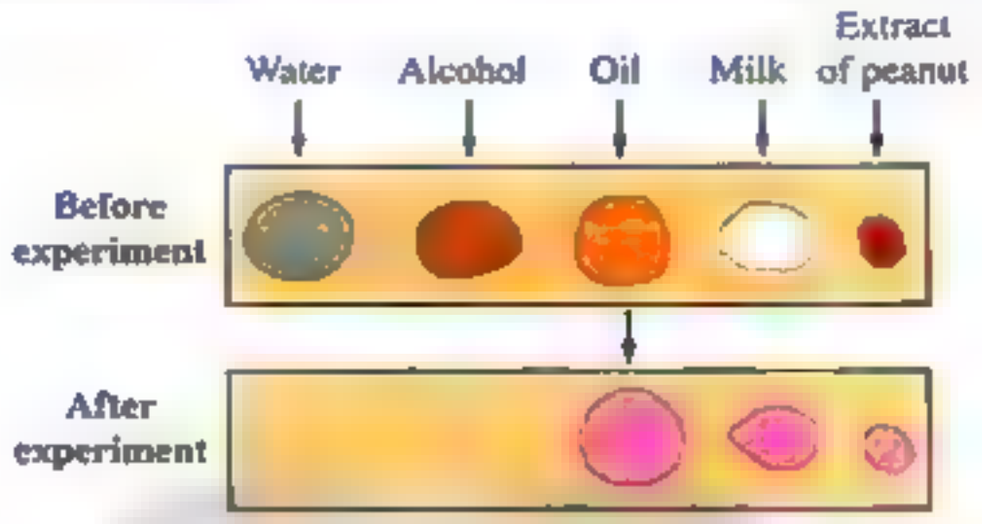


(2)



(3)

26 The following figure illustrates the results of an experiment in which Sudan-4 reagent has been added to the illustrated substances. **Arrange the substances in this figure, according to their contents of lipids, then explain the results of this experiment.**



27 **You have three unknown substances (X), (Y) and (Z), and it is required to identify each one of them by using the indicators (1), (2) and (3), and the results were as shown in the following table :**

Substance / Indicator	(X)	(Y)	(Z)
(1)	(+) Orange	(–) Blue	(–) Blue
(2)	(–) Orange	(+) Blue	(–) Orange
(3)	(–)	(–)	(+) Red colour

(+)	Represents the positive result.
(–)	Represents the negative result.

Answer the following questions, in the light of your study :

(a) **What** do you expect that each of (X), (Y) and (Z) substances to be ?

(b) **What** do the indicators (1), (2) and (3) represent ?

(c) **What happens on :** adding water to each of the substances (X), (Y) and (Z) ?

(d) **Give reason for :** the indicator (3) gives a positive result, when it is added to the substance (Z).

Model Exam on

Chapter 1

Chemical Structure of Living Organisms' Bodies (Carbohydrates and Lipids)

Choose the correct answer (1 : 10) :

1 The following table shows the elements that enter in the formation of 4 chemical compounds, which of these compounds represents an inorganic compound ? .....

Chemical compound	Oxygen	Phosphorus	Carbon	Hydrogen	Nitrogen
(a)	✓	✓	✓	✓	–
(b)	✓	–	✓	✓	✓
(c)	–	–	✓	✓	–
(d)	✓	–	–	✓	✓

2 All lipids contain fatty acids, but not all of them contain glycerol molecules, ...

(a) the two statements are correct and related.
(b) the two statements are correct and not related.
(c) the first statement is correct and the second statement is wrong.
(d) the first statement is wrong and the second statement is correct.

3 The living cells don't use lipids as a source of energy, unless in case of the absence of carbohydrates, because .....

(a) the calorie content of carbohydrates is greater than that of the lipids.
(b) the living cells can't store the carbohydrates.
(c) the energy can be extracted from carbohydrates easily.
(d) the carbohydrates have no other use, except the production of energy.

4

From the previous diagram, which of the following represents (Y), (X) and (Z) respectively ? .....

(a) Glycogen, glucose and cellulose.
(b) Glucose, cellulose and ATP
(c) Cellulose, glucose and ATP
(d) Cellulose, glycogen and glucose.

5 Papers are made of plant fibers that consist of monomers called .....

(a) starch. (b) glucose.

(c) cellulose. (d) sucrose.

6 Simple lipids are different in their physical state at room temperature, due to the difference of the .....

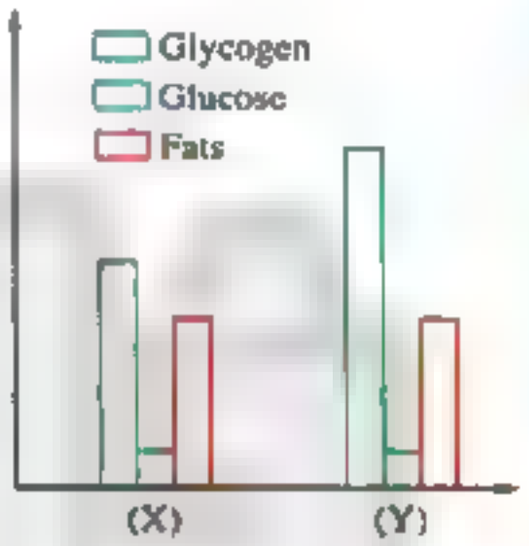
(a) type of alcohol that they contain.

(b) type of fatty acids that form them.

(c) number of carbon atoms.

(d) number of phosphate groups that they contain.

7 The opposite graph shows an amount of each of glycogen, glucose and fats in the humerus muscle, where (X) represents the muscle during exercises and (Y) represents the muscle at rest, from this graph we can conclude that the muscle .....



(a) consumes glycogen during exercises.

(b) stores fats at rest.

(c) consumes glycogen at rest.

(d) consumes fats during exercises.

8 From the adaptations that helps the desert plants to keep their life, especially in drought season, is .....

(a) the presence of a layer of phospholipids in their cell membranes.

(b) the presence of a thick waxy layer that covers their leaves.

(c) the presence of glycogen molecules stored in their cells.

(d) the presence of a large number of mitochondria inside their cells.

9 The sex hormones are considered from lipids and not from carbohydrates, because they .....

(a) enter in the structure of plasma membrane.

(b) have a high molecular weight.

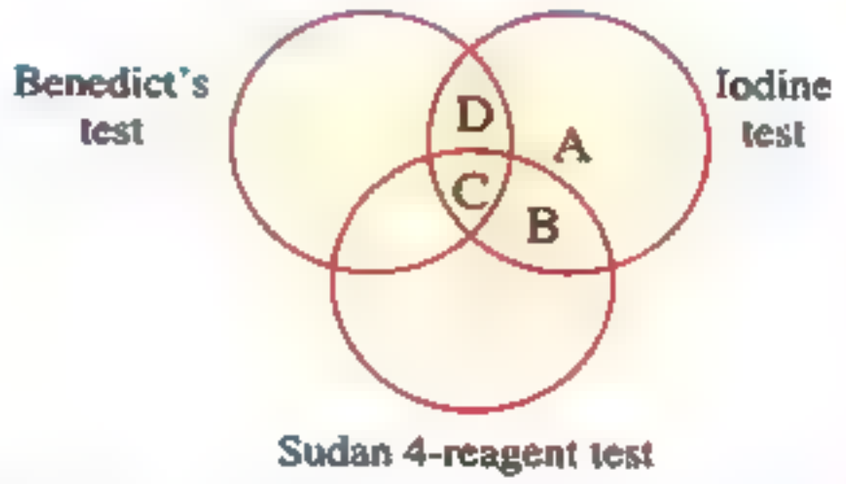
(c) are soluble in non-polar solvents.

(d) are responsible for the appearance of secondary sex characters.

UNIT 1

(10) The opposite figure illustrates the results of the test of 4 solutions containing different biological compounds, which one contains starch and fats ? .....

ⓐ A ⓑ B
ⓒ C ⓓ D



Answer the following questions (11 : 17) :

(11) The corn grains contain a stored food that is used by the embryo in its growth and differentiation under the soil surface, as the embryo can't perform the photosynthesis process, and this is due to the absence of chlorophyll and light. **In the light of your study for the biological macro-molecules :**
What are the stored biological macro-molecules in the grain ?

(12) **What happens if :** the cellulose of plant cell walls was replaced by maltose ?

(13) "The fasting person can practice his daily activities despite the long periods of fasting". **Explain this statement in the light of your study.**

(14) "Phospholipids are formed by the union of three fatty acids and a trihydric alcohol".
How far this statement is correct ? With explanation.

15 Each of the cotton filaments and linen filaments is used in the manufacture of clothes and contains water insoluble polymers, **determine** these polymers, then **conclude** from **which** type of biological macro-molecules the cotton and linen filaments formed.

16 **What happens in case of :** putting a polar animal (polar bear for example) in a zoo in a country with hot climate ?

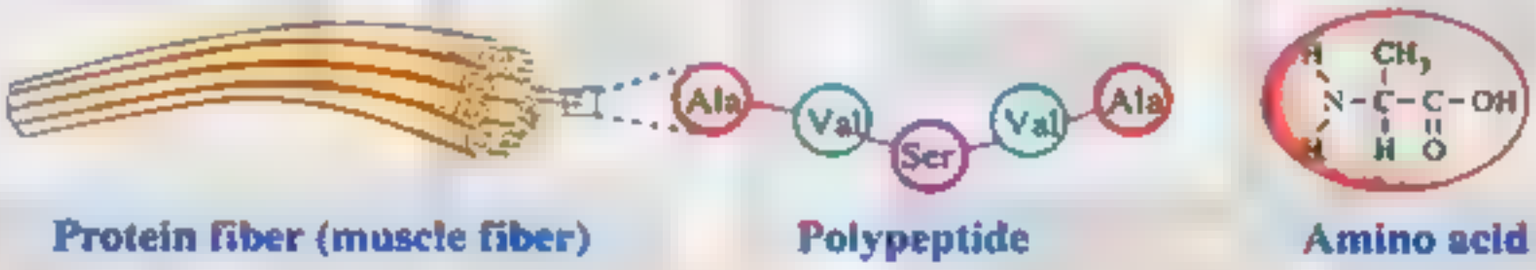
17 "During your performance to detect some types of carbohydrates in school lab, the biology teacher asked you to identify two unknown powders with white colour belonging to two different types of sugars".
Show practically how to know these substances.

LESSON
ONE

Proteins

Proteins

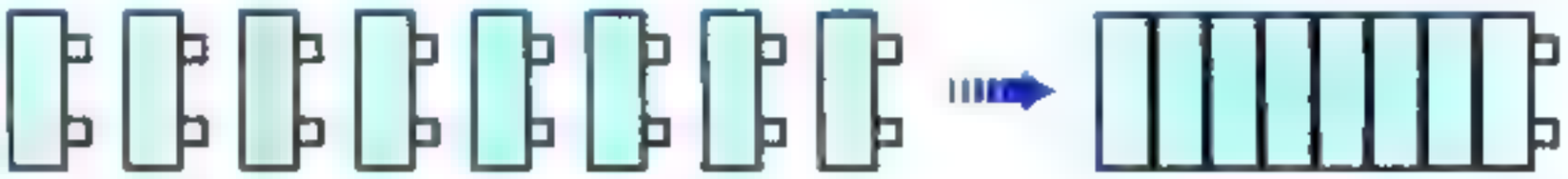
- They are biological macro-molecules (polymers) that are made up of many smaller molecules (monomers) called amino acids.
- They consist of carbon (C), hydrogen (H), oxygen (O) and nitrogen (N) atoms.



Protein fiber is made up of polypeptide which consists of amino acids

Molecular structure of proteins

- Proteins have a high molecular weight and made up of building units which are the amino acids.



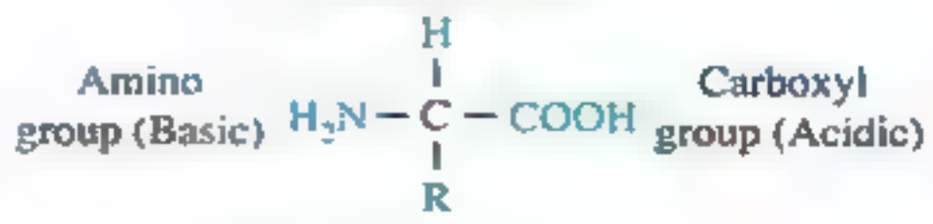
Protein consists of amino acids

Amino acids

- Amino acid is the building (structural) unit of the protein, and consists of a **carbon atom** that is attached to :
  1. Hydrogen atom (H).

2 Two functional groups which are :
- A basic amino group (NH_2).
- An acidic carboxyl group (COOH).

3 A terminal (alkyl) group (R) which differs from an amino acid to another. So, it determines the type of amino acid.

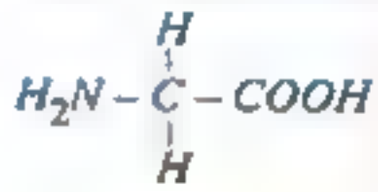


General formula of the amino acid

- **From the previous,** it is clear that the amino acids are organic compounds that are made up of carbon (C), hydrogen (H), oxygen (O) and nitrogen (N) atoms.

For illustration only

Glycine is the only amino acid that doesn't contain terminal (alkyl) group (R), where it is replaced by a hydrogen atom.


Glycine

Test yourself

1 Choose the correct answer :

The final form resulted from the digestion of a meal which consists of bean with oil and bread are ..... respectively.

ⓐ fatty acids and glycerol – amino acids – glucose
ⓑ amino acids – glucose – fatty acids and glycerol
ⓒ glucose – fatty acids and glycerol – amino acids
ⓓ amino acids – fatty acids and glycerol – glucose

2 The amino acids behave like acids and alkalis, explain this.

.....

.....

Building of proteins from the amino acids

1 Proteins are made up of repeated units of amino acids which link with each other by peptide bonds.

2 The peptide bond originates between the carboxyl group (COOH) of an amino acid and the amino group (NH_2) of another amino acid, through the removal of a water molecule (OH^- group from the carboxyl group of an amino acid and H^+ ion from the amino group of the other adjacent amino acid).

UNIT 1

For illustration only

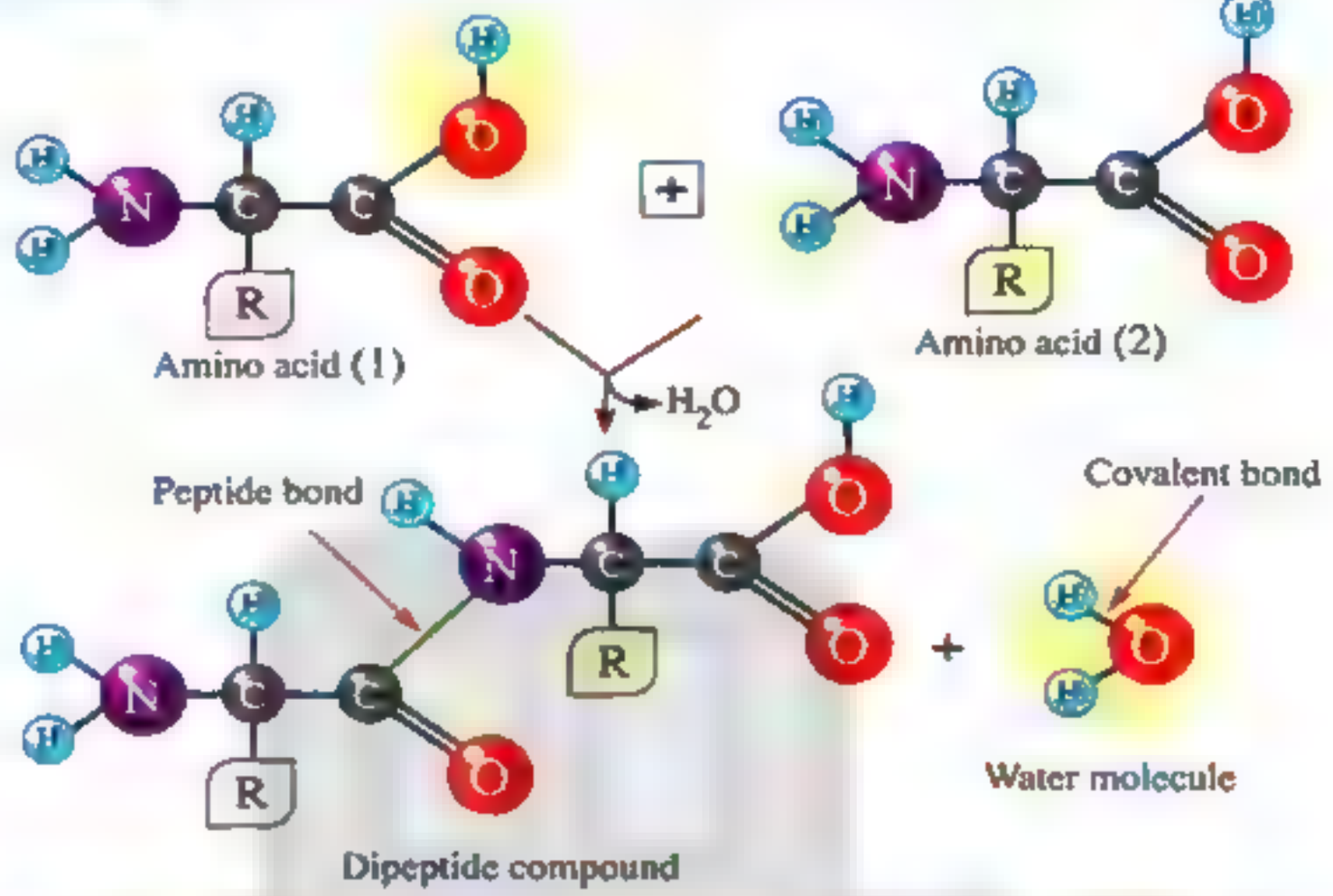


Figure illustrates the link between two amino acids by a peptide bond

3 **On the combination of :**

Two amino acids produces a dipeptide compound.

1 Amino acid — Peptide bond — 2 Amino acid

Several amino acids produces a polypeptide chain.

1 Amino acid — Peptide bond — 2 Amino acid — Peptide bond — 3 Amino acid — Peptide bond — 4 Amino acid

- **A diagram illustrates the building of protein from amino acids :**

Amino acids $\underset{\text{Hydrolysis}}{\overset{\text{Polymerization}}{\rightleftharpoons}}$ **Polypeptide chain** $\underset{\text{Hydrolysis}}{\overset{\text{Polymerization}}{\rightleftharpoons}}$ **Protein**

4 It is not condition on the protein formation, the combination among similar amino acids occurs. So, there are extensively wide and various possibilities to form proteins, depending on the **types**, **order** and **numbers** of amino acids in the polypeptide chain.

Note

There are 20 different types of amino acids that enter in the composition of proteins, such as glycine (Gly), alanine (Ala) and valine (Val) amino acids.

For illustration only

- **Example :** *some possibilities of the combination of glycine (Gly), alanine (Ala) and valine (Val) amino acids.*

  Possibility no. 1 : Gly - Ala - Val - Gly - Ala - Val - Gly - Ala - Val - Gly

  Possibility no. 2 : Gly - Val - Ala - Gly - Val - Ala - Gly - Val - Ala - Gly

  Possibility no. 3 : Gly - Gly - Val - Ala - Gly - Gly - Val - Ala - Gly - Gly

  Possibility no. 4 : Val - Val - Ala - Ala - Gly - Gly - Val - Val - Ala - Ala

- *The human body can produce 11 types of amino acids and obtain the other 9 types through the meals, so that it is necessary to eat foods containing proteins to compensate what the body needs from these amino acids, in order to build his body.*

2 Test yourself

1 Choose the correct answer :

(1) The number of water molecules that are resulted from the combination of 5 amino acids with each other is ..... molecule(s).

ⓐ 10

ⓑ 5

ⓒ 4

ⓓ one

(2) Two similar types of amino acids can form a .....

ⓐ dipeptide compound.

ⓑ polysaccharide compound.

ⓒ polypeptide compound.

ⓓ (a) and (c) together.

2 "The proteins are made up of repeated units of amino acids linked together by glycosidic bonds". How far this statement is correct ? With explanation.

.....

.....

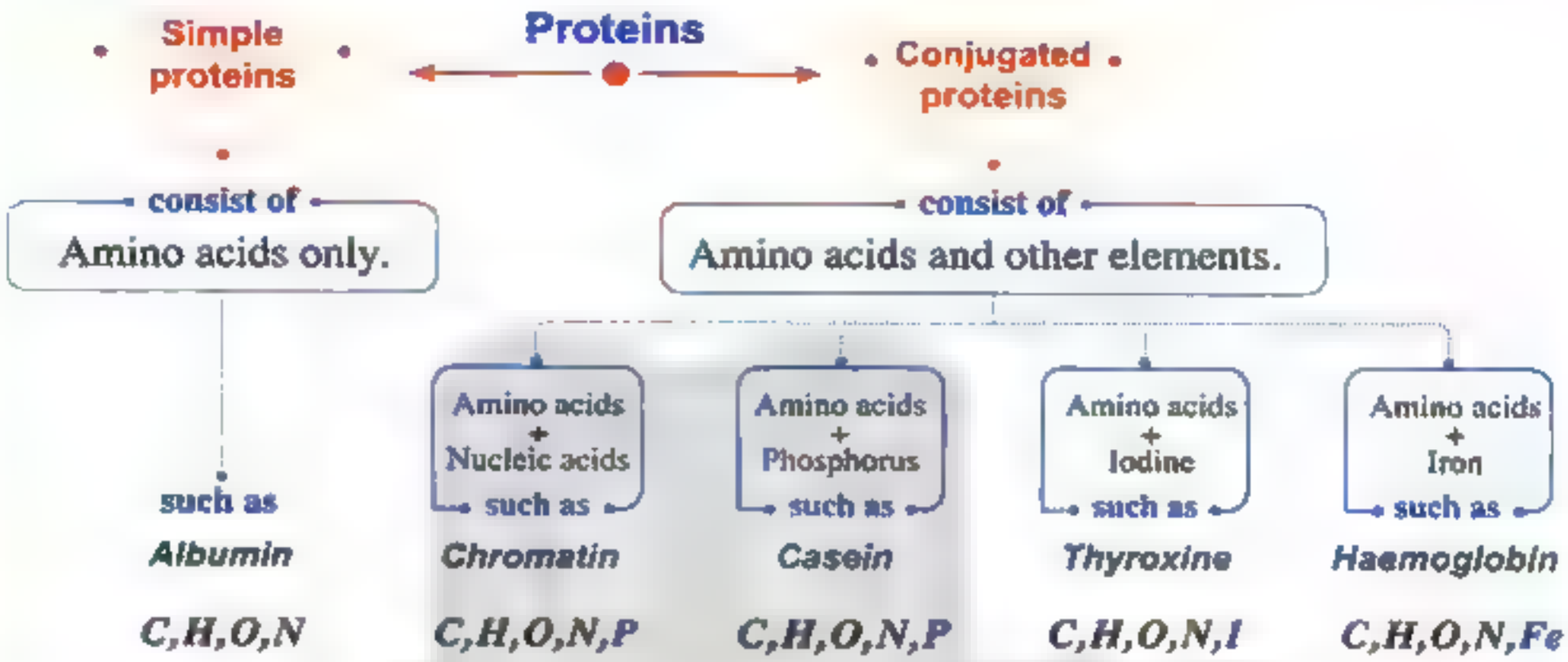
.....

.....

UNIT 1

Classification of proteins

- Proteins are classified, according to the substances involved in their structure, as follows :



1 Simple proteins

- They are formed of amino acids only.
- **Example : albumin protein which is present in :**
  - Plant leaves and roots.
  - Human blood plasma.

Enrichment

Albumin protein is formed in the liver, and it plays an important role in maintaining the osmotic pressure between the blood and tissues to prevent the leaking of fluids from blood vessels into the tissues. Therefore, its lack in the body leads to the appearance of some symptoms on the patient, as a result of the occurrence of a disorder in the maintaining of osmotic pressure of the cell and makes the body keep large amounts of fluids that causes a swelling in the feet and face.

2 Conjugated proteins

- They are made up of amino acids associated with other elements, such as : **phosphorus, iodine, iron**... and others.
- **Examples :**

	1 Chromatin	2 Casein (Milk protein)	3 Thyroxine (Thyroid gland hormone)	4 Blood haemoglobin (Red blood cells protein)
The amino acids linked with	The nucleic acids (Nucleic proteins)	Phosphorus (Phosphoproteins)	Iodine	Iron

3 Test yourself

1 Choose the correct answer :

All the following biological macro-molecules enter in the structure of some parts of the plant, except the .....

ⓐ cellulose. ⓑ starch. ⓒ phospholipids. ⓓ albumin.

2 Mention the similarities and differences between :

P.O.C.	Albumin protein	Chromatin protein
Similarities :	.....	
Differences :	.....	.....

Importance of proteins

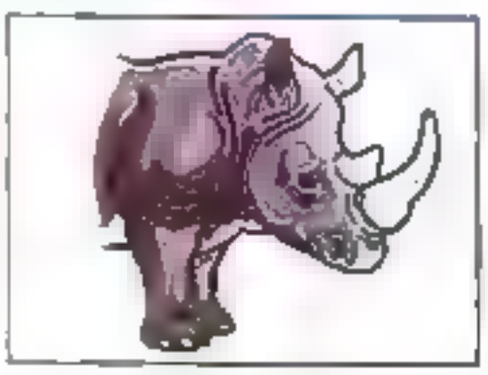
1. Proteins are contributed in the biochemical processes that keep the life and work on its continuity, where they enter in the structure of enzymes and many hormones that stimulate and regulate all the vital functions in the body.
2. They represent the structural unit for all the living organisms, where they enter in the structure and functions of all the living cells, **as they :**
   - Are one of the basic components of the cell membranes and chromosomes.
   - Form the muscles, ligaments, tendons, organs, glands, nails, hair and skin.
   - Enter in the structure of many vital body fluids, such as blood and lymph.
3. They are necessary for the body growth.

Note

Spider's net, the hooves and horns of animals are mainly made up of proteins.

Spider's net

Hooves



Horns

UNIT 1

Test yourself

Choose the correct answer :

(1) Proteins are similar to lipids in that each of them enters in the structure of .....

ⓐ enzymes. ⓑ hormones. ⓒ chromosomes. ⓓ (a) and (b) together.

(2) After surgeries, doctors often advise to eat food containing .....

ⓐ fats. ⓑ proteins. ⓒ carbohydrates. ⓓ mineral salts.

(3) Which of the following represents the correct arrangement for obtaining energy rapidly from the following foods ? ..... **(Explain your answer)**

ⓐ Peanut – Grapes – Milk – Red meats.

ⓑ Milk – Peanut – Grapes – Red meats.

ⓒ Grapes – Milk – Peanut – Red meats.

ⓓ Red meats – Peanut – Milk – Grapes.

Explanation : .....

.....

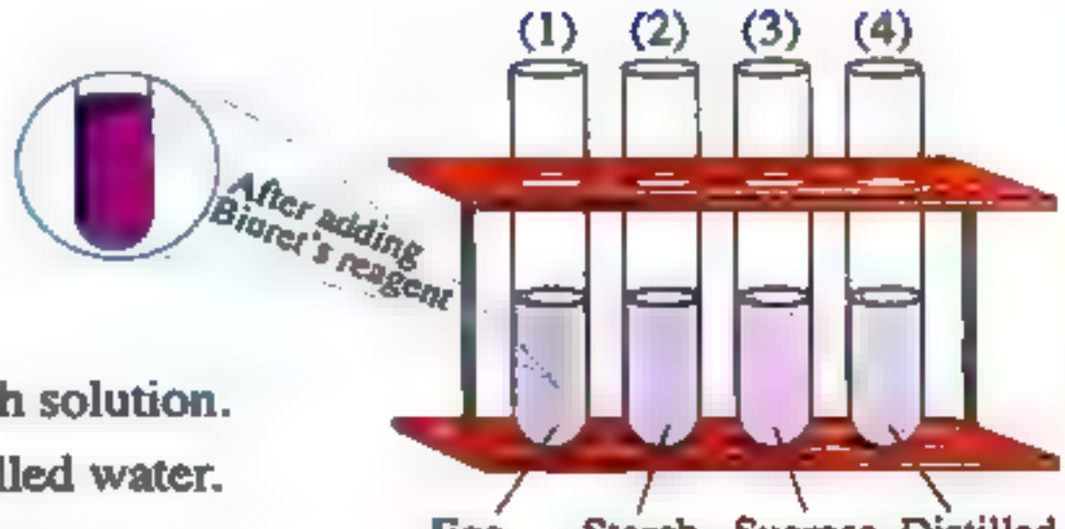
Practical Activity 4 Detection of proteins

1. Used materials and tools :

- Tubes rack.
- 4 test tubes.
- Egg albumin.
- Starch solution.
- Sucrose solution.
- Distilled water.
- Blue Biuret's reagent.

2. Procedures :

1. Label the test tubes from (1) : (4).
2. In the 4 tubes put respectively 2 mL of :
   - Egg albumin.
   - Starch solution.
   - Sugar solution.
   - Distilled water.
3. Add 2 mL of Biuret's reagent to each tube.



3. Observations and explanations :

Tube no.	Substance	Observations	Explanations
(1)	Egg albumin.	The reagent's colour turns into violet. (Positive result)	The colour of reagent in tube no. (1) is changed, because egg albumin contains a protein that changes the blue colour of Biuret's reagent into the violet colour.
(2)	Starch solution.	The reagent's colour doesn't change. (Negative result)	The colour of reagent is not changed in the other three tubes, because they don't contain protein.
(3)	Sucrose solution.		
(4)	Distilled water.		

4. Conclusion :

Biuret's reagent is used for detecting the proteins in various foods.

Life application :

Biuret's reagent is used for detecting the presence of protein in urine.

Test yourself

Choose the correct answer :

(1) In urine analysis for a woman suffering from diabetes disease, the reagent that can be used is .....

ⓐ Sudan-4 reagent. ⓑ Biuret's reagent.

ⓒ Benedict's reagent. ⓓ Iodine solution.

(2) The doctors advise the patient suffering from anemia with eating foods rich in ..... element.

ⓐ phosphorus ⓑ iron

ⓒ iodine ⓓ sulphur

CHAPTER 2

QUESTIONS ON LESSON One

Proteins

Interactive test

The questions signed by ✓ measure the high levels of thinking.

First Multiple Choice Questions

1 In amino acid "valine", the terminal groups attach with the ..... atom.

ⓐ carbon ⓑ oxygen ⓒ nitrogen ⓓ hydrogen

2 ✓ By using the following figure, which of the choices present in the table could express the following figure ? .....

(1) (2)

	(1)	(2)
ⓐ	Starch	Glucose
ⓑ	Amino acids	Polypeptide chain
ⓒ	Glucose	Cellulose
ⓓ	Glucose	Starch

3 The number of free carboxyl groups in the polypeptide chain consisting of 4 amino acids is .....

ⓐ 1 ⓑ 3 ⓒ 4 ⓓ 5

4 If you know that the monosaccharides attach with each other by glycosidic bonds through losing a water molecule, therefore the formation of a glycosidic bond is similar to the formation of a peptide bond in the .....

ⓐ type of polymers that are resulted from each one of them.

ⓑ type of monomers that binded by the two bonds.

ⓒ functional groups that enter in the reaction.

ⓓ secondary products in both reactions.

5 The polypeptide chain that consists of 8 amino acids needs ..... peptide bonds.

ⓐ 4 ⓑ 6 ⓒ 7 ⓓ 8

6 The following figures represent some different proteins that consist of alanine ○, valine □ and methionine ◇ amino acids, in the light of this, answer :

Protein (1) : 

Protein (2) : 

Protein (3) : 

(1) The protein (1) differs from the protein (3) in the .....

ⓐ number of amino acids. ⓑ type of amino acids.

ⓒ order of amino acids. ⓓ number of peptide bonds.

(2) The protein (2) is similar to the protein (3) in the .....

ⓐ number of amino acids. ⓑ type of amino acids.

ⓒ order of amino acids. ⓓ number of peptide bonds.

(3) The arrangement of amino acids in the polypeptide chain no. (1) is .....

ⓐ valine – alanine – valine – methionine – valine.

ⓑ valine – alanine – methionine – alanine – methionine.

ⓒ valine – alanine – valine – alanine – methionine.

ⓓ valine – alanine – methionine – valine – methionine.

---

7 If we supposed adding an amino acid in a polypeptide chain that forms a protein, therefore all the following would occur, except the .....

ⓐ change of protein's type.

ⓑ increase in the number of peptide bonds.

ⓒ loss of a water molecule.

ⓓ difference in the functional group at the terminal of the chain.

---

8 If we supposed replacing an amino acid in a polypeptide chain that forms a protein with another different amino acid, therefore the .....

ⓐ protein's type would change. ⓑ protein would remain the same.

ⓒ number of peptide bonds would increase. ⓓ number of peptide bonds would decrease.

---

9 In order to form a polypeptide chain from 3 similar amino acids attached to each other for several times and with various arrangements, therefore the maximum number of the formed polypeptide chains' types is ..... chain(s).

ⓐ one ⓑ two ⓒ three ⓓ six

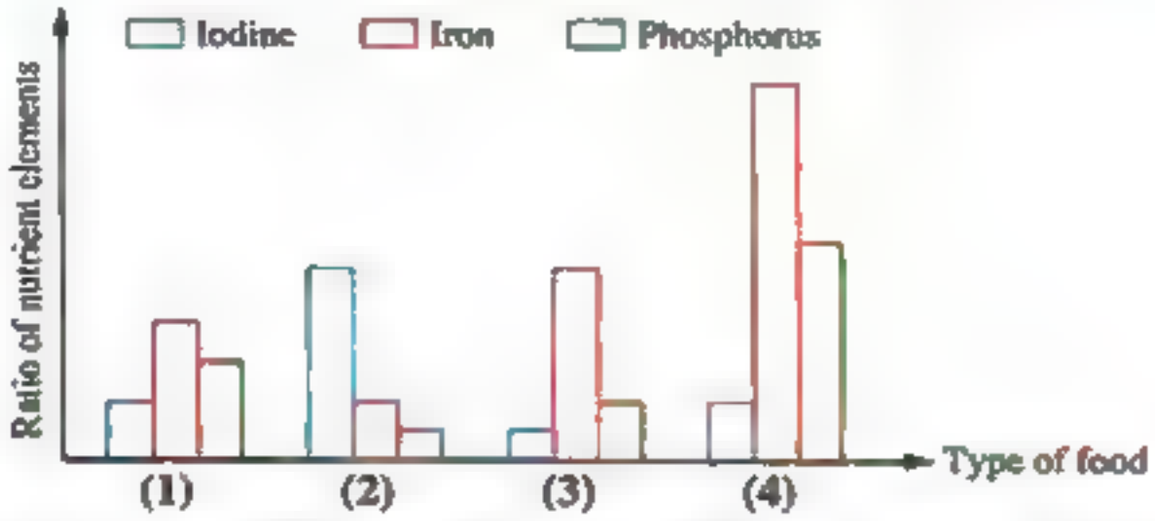
---

10 Which of the following substances the nitrogen element enters in its structure ? .....

ⓐ Glycogen. ⓑ Galactose. ⓒ Thyroxine. ⓓ Glucose.

UNIT 1

11 The following graph illustrates the ratios of some nutrient elements in some different types of food, study it, then answer :



(1) Which type of food increases the efficiency of gas exchange process in human blood ? .....
ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

(2) Which type of food contributes greatly in the formation of thyroid gland protein ? .....
ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

12 Milk helps in building the body tissues, because it contains .....
ⓐ casein. ⓑ fats. ⓒ lactose. ⓓ mineral salts.

13 Milk is considered from the fast sources for obtaining energy in human, because it contains .....
ⓐ casein. ⓑ fats. ⓒ lactose. ⓓ mineral salts.

14 If the diet that you ate yesterday was consisting of 300 g of rice, 300 g of red meat, 50 g of butter and 250 g of grapes. In the light of this, answer :

(1) Which of the diet components contains the largest amount of energy in one gram, after its digestion ? .....
ⓐ Rice. ⓑ Meat. ⓒ Butter. ⓓ Grapes.

(2) Which of the diet components is the excess of it stored in the body muscles, after its digestion ? .....
ⓐ Rice. ⓑ Butter. ⓒ Grapes. ⓓ Meat.

(3) Which of the diet components is transferred to mitochondria directly, after its digestion ? .....
ⓐ Meat. ⓑ Rice. ⓒ Butter. ⓓ Grapes.

(4) Which of the diet components is used by the body cells first to produce energy, after its digestion ? .....
ⓐ Rice. ⓑ Grapes. ⓒ Meat. ⓓ Butter.

(5) Which of the diet components is used by the body to compensate the damaged tissues ? .....
ⓐ Grapes. ⓑ Meat. ⓒ Butter. ⓓ Rice.

15 A person was exposed to an accident, this led to the occurrence of a deep wound in his right arm. Which of the following would their eating help in healing the wound rapidly ? .....

ⓐ Fresh vegetables and milk. ⓑ Fresh fruits and eggs.

ⓒ Meats and eggs. ⓓ Milk and rice.

16 By using the symbols, glucose (G) and amino acid (AA), which of the following represents a part of pepsin enzyme ? .....

ⓐ –AA–AA–AA–AA–AA–AA– ⓑ –AA–G–AA–G–AA–AA–

ⓒ –G–G–AA–G–AA–G– ⓓ –G–G–G–G–G–G–

17 Each of the hooves and horns consists of different proteins, due to the difference in the ..... their building units.

ⓐ number of water molecules that is present in ⓑ types, order and number of

ⓒ free carboxyl group in ⓓ free amino group in

18 The opposite table shows the percentage of each of the proteins, lipids and carbohydrates in 4 different food samples :

Sample	Proteins%	Lipids%	Carbohydrates%
(1)	76	9	15
(2)	17	0	83
(3)	33	32	35
(4)	15	83	2

(1) From which sample of them can the body get the greatest amount of energy ? .....

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

(2) Which sample of them has a greater chance to be stored in the liver ? .....

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

(3) From which sample of them makes the body benefit with a greater proportion in building its tissues ? .....

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

(4) Which sample of them may the amount of energy resulted from the lipids be nearly equal to the amount of energy resulted from the carbohydrates ? .....

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

19 Biuret's indicator gives a positive result with the .....

ⓐ grape juice. ⓑ peanut powder.

ⓒ wheat powder. ⓓ bean seeds powder.

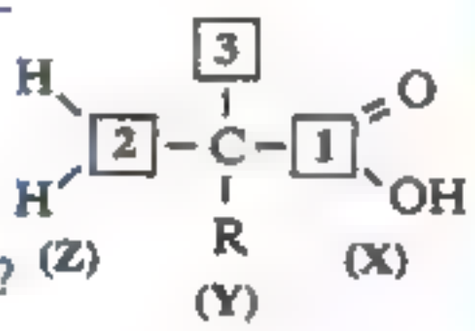
UNIT 1

Second Miscellaneous Questions

1 **Write what this statement indicates :**
"A monomer has an acidic and a basic nature together".

2 **Write what this statement indicates :** "A polymer consists of one type of monomers, but they may be different in the structure".

3 **From the opposite figure :**



(a) **What** does this figure represent ?
(b) **What** do the numbers from no. (1) : (3) represent ?
(c) **Which** of the letters represent(s) the functional groups of this figure ?
(d) **Mention** the letter of the group by which the name of figure changes completely when changing it.
(e) **What** is the name of the compound that is resulted from the combination of two units of this figure ? **And how** does this combination occur ?
(f) **What** is the type of the bond that is formed on the combination of several units of this figure ? **And what** is the name of the resulting compound ?

4 **What happens in case of :** replacing the alkyl (R) group in an amino acid with another alkyl group ?

5 **What are the similarities and differences between :** amino acids **and** fatty acids ?

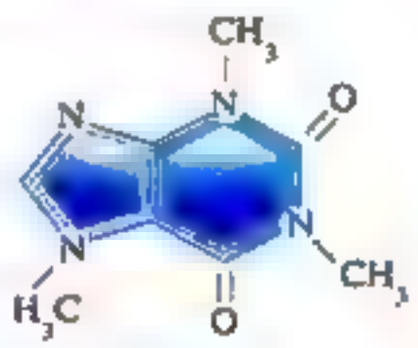
6 **Give reason for :** the alkyl group (R) determines the type of amino acid.

7 "There is a limited number of protein compounds, as a result of the presence of 20 types of amino acids". **How far this statement is correct ? With explanation.**

8 **Explain :** the formation of a polypeptide chain is considered a dehydration reaction.

9 **What happens in case of :** changing the type of an amino acid in a certain protein ?

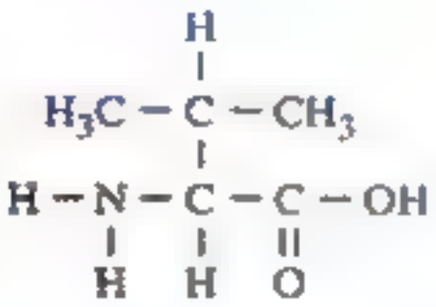
10 **Does** the opposite figure represent an amino acid or not ?
Explain your answer.

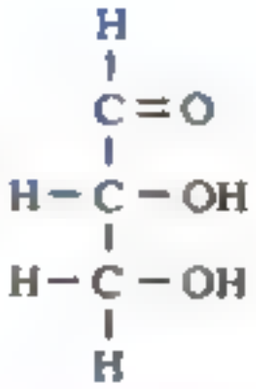


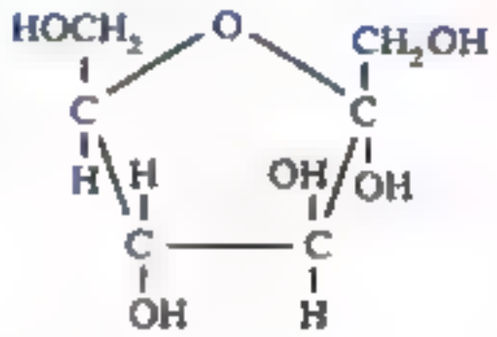
11 **The following figure shows a chemical reaction that occurs inside the living organism's cell, in order to build a body tissue, study it, then answer the following :**

(a) **What** is the name of this process ?
(b) **Draw** the resulting compound (X).
(c) **Mention** the number of (Y).

12 Classify the following chemical compounds, then illustrate the reason for this classification :

(a) 

(b) 

(c) 

---

13 **A meal consists of bean with oil and bread :**

(a) **Mention** the biological macro-molecules in this meal.

(b) **Mention** the final form that is resulted from the digestion of the components of this meal.

---

14 **Mention what the following statements indicate :**

(a) A polymer that iodine element enters in its basic structure.

(b) A polymer that iron element enters in its basic structure.

(c) A polymer that phosphorus element enters in its basic structure.

---

15 "Some plant proteins are similar to the proteins that are present in human". **How far this statement is correct ? With explanation.**

---

16 **What happens if :** the amino acids that form proteins are similar in the order, number and type ?

---

17 "Milk contains many components, such as proteins and sugars". **Mention** the name of the protein and sugar that are present in milk, **then mention** their type and structure.

---

18 Some individuals suffer from anemia disease, if you were asked to advise them about the nutrition style. **What** do you advise them in the light of your study ?

---

19 "The shortage of iodine element in the body causes a disturbance in the thyroid gland". **How far this statement is correct ? With explanation.**

---

20 When the shortage of one of the body hormones takes place, the activity of individual decreases, and in order to cure this sluggishness, doctors advise to eat marine weeds that are rich in iodine element, **deduce the name of this hormone in the light of your study.**

---

21 "The lactating mothers are advised to eat suitable amounts of marine animals". **Explain this, knowing that these marine animals are rich in phosphorus element.**

---

22 **What are the similarities and differences between :** haemoglobin protein **and** thyroxine protein ?

UNIT 1

23 **What is the relation between :** proteins and the animal movement ?

24 The human blood contains a various group of proteins, **mention** two of these proteins, **illustrate** the type of each one, **and compare** between them.

25 **"Egg white contains a polymer that converts the Biuret's reagent colour into violet colour". In the light of your study, answer :**

(a) What are the biological macro-molecules that this polymer belongs to ?

(b) If this polymer is present in the plant leaves, **what** is it ? **And what** is its type ?

26 **The following table illustrates what some food substances contain of some large-sized molecules in grams, by using the data in this table :**

Type of food substance	Carbohydrates / g	Lipids / g	Protein / g
Bean	10	0.4	9
Bread	48	1.5	0.5
Egg	0	34	25

Determine the type of food substance :

(a) Is used by the body first to get energy.

(b) Participates less in the structure of blood.

(c) Is not stored in the liver.

(d) Participates more in the formation of sex hormones (steroids).

27 **Compare between :** the building substances for the body **and** the delayed energy substances in the body, **"according to :** name – molecular structure – building unit – types".

28 "The plant uses the nitrogenous fertilizers to build the amino acids". **How far this statement is correct ? With explanation.**

29 A student added some drops of blue-coloured reagent to a white-coloured powder, then the colour was changed into violet, **what** does this powder represent ? **And what** is the name of this indicator ?

30 You have three types of seeds' extracts, one of them is rich in starch, the second is rich in oils and the third is rich in proteins. **Illustrate how you can differentiate between them practically.**

31 Insulin molecule consists of two polypeptide chains, chain (A) consists of 21 amino acids and chain (B) consists of 30 amino acids, where these two chains bind together by disulphide bonds, **according to this answer the following :**

What is the type of the chemical bonds among the amino acids only in the polypeptide chain (A) ? **And what** is the number of these bonds in insulin molecule ?

LESSON
TWO

Nucleic Acids

Nucleic acids

- They are biological macro-molecules (polymers) that are made up of many smaller molecules (monomers) called nucleotides.
- They consist of carbon (C), hydrogen (H), oxygen (O), nitrogen (N) and phosphorus (P) atoms.

For illustration only

The chromosome contains DNA that consists of nucleotides

Molecular structure of nucleic acids

- Nucleic acids are made up of building units which are the nucleotides that bind together by covalent bonds to form the polynucleotide (nucleic acid).

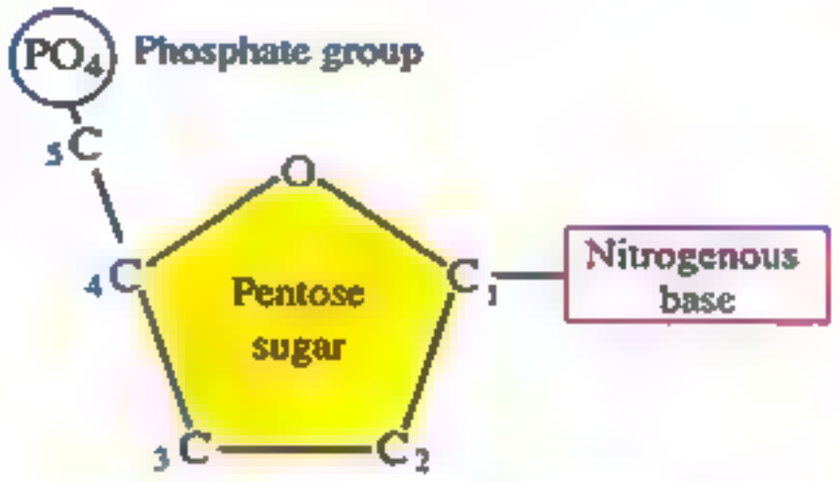
For illustration only

- *In eukaryotes, the single chromosome consists of one molecule of DNA that is coiled for several times to shorten its size, therefore it can fit into the nucleus of the cell. In prokaryotes (E.coli bacteria), its own DNA was able to be straightened, so that its length reached 1.4 mm, while the length of cell reached 2 micron. So, DNA molecule is folded many times around itself and occupied the nuclear area about 0.1 of the cell's volume.*

UNIT 1

Nucleotide

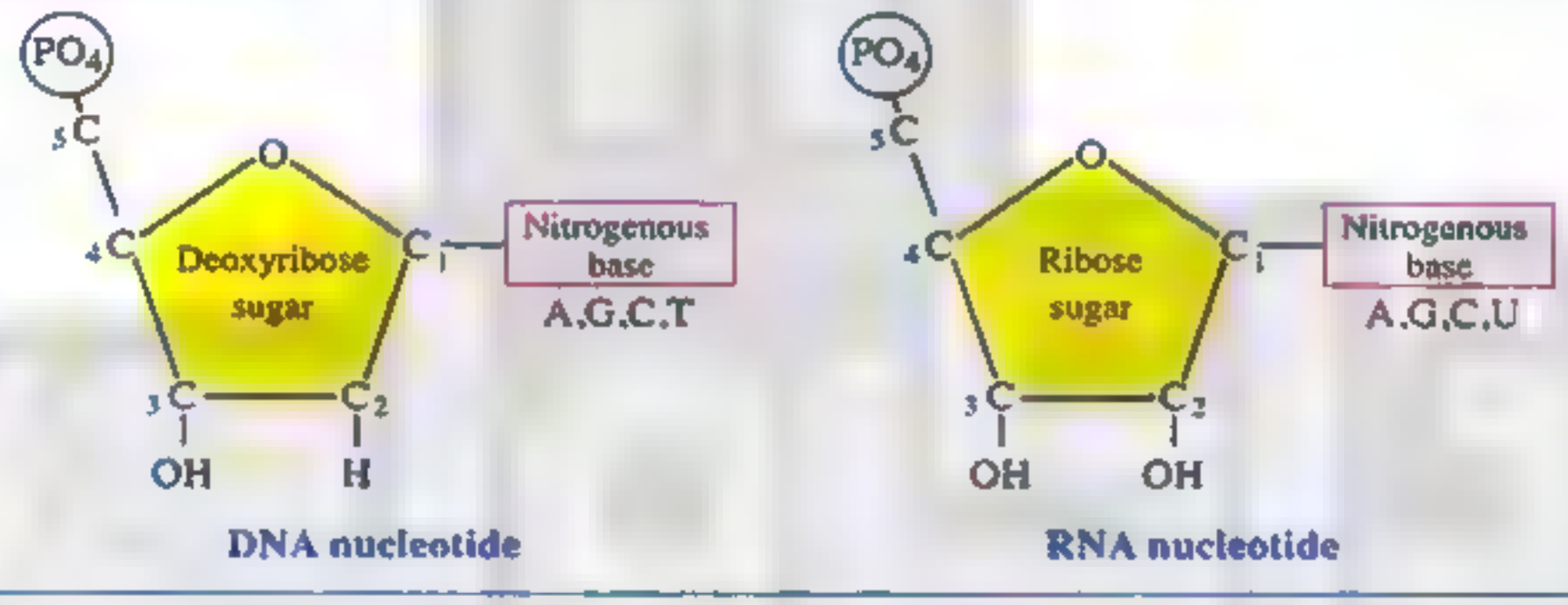
- It is the basic building unit of the nucleic acid, and consists of three units which are :



Structure of the nucleotide

1. **A molecule of pentose sugar** (consists of five carbon atoms), and there are two main types of sugar, which are :
   - Deoxyribose sugar that enters in the structure of DNA's nucleotide.
   - Ribose sugar that enters in the structure of RNA's nucleotide.

For illustration only



2. **Phosphate group :** attaches with the carbon atom no. (5) of sugar molecule by covalent bond.
3. **Nitragenous base :** attaches with the carbon atom no. (1) of sugar molecule by covalent bond, and there are five nitrogenous bases which are :
   Adenine (A), guanine (G), cytosine (C), thymine (T) "in DNA molecule" and uracil (U) is present in RNA molecule instead of thymine.

- **From the previous,** it is clear that the nucleic acid DNA differs from the nucleic acid RNA in the type of pentose sugar and one of the nitrogenous bases that form it.

Test yourself

Choose the correct answer :

(1) Which of the following is similar with DNA in the presence of phosphorus element in the structure ? .....

ⓐ Phospholipids. ⓑ Glycogen.
ⓒ Casein. ⓓ (a) and (c) together.

(2) Rat differs from rabbit. because the cells of each one of them contain .....

ⓐ different inorganic molecules.

ⓑ different large-sized organic molecules.

ⓒ different molecules of lipids.

ⓓ different sequences of nucleotides in their DNA

Classification of nucleic acids

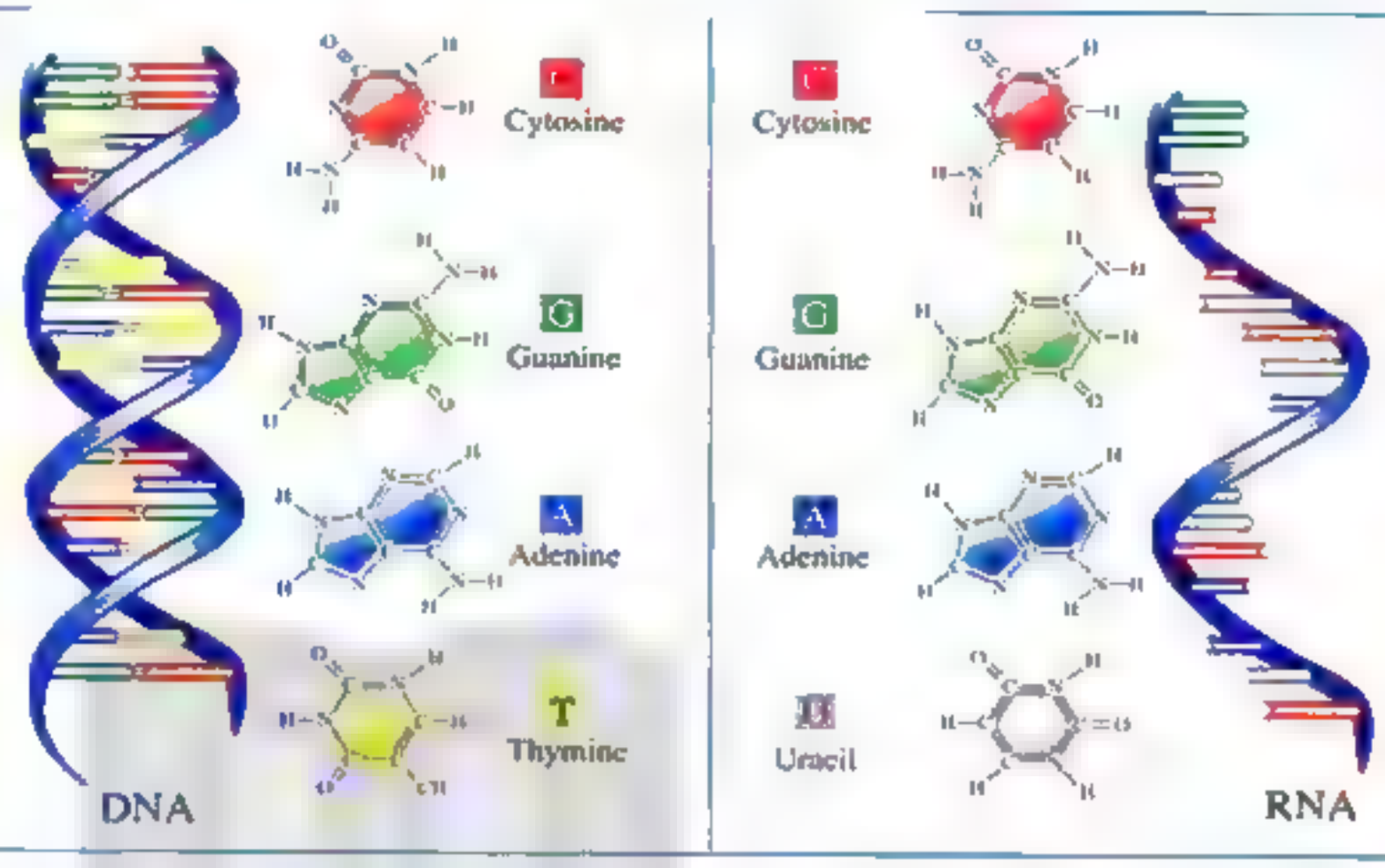
- **There are two types of nucleic acids, which are :**
  1. Deoxyribonucleic acid (DNA).
  2. Ribonucleic acid (RNA).

☆ **The following table shows the differences between the two types of nucleic acids :**

P.O.C.	Deoxyribonucleic acid (DNA)	Ribonucleic acid (RNA)
Type of pentose sugar in the nucleotide :	Deoxyribose sugar (which lacks an oxygen atom than ribose sugar).	Ribose sugar.
Nitrogenous bases :	- Adenine (A). - Guanine (G). - **Thymine** (T). - Cytosine (C).	- Adenine (A). - Guanine (G). - **Uracil (U).** - Cytosine (C).
No. of strands in each molecule :	Two strands of nucleotides.	Single strand of nucleotides.
Importance :	• It is carried on the chromosomes inside the cell nucleus, where it carries the genetic information that pass from a generation to another, when the cells divide and these information are responsible for : - Appearing the distinctive characters of the living organism. - Organizing all the vital activities of the cells.	• It is transcribed from the nucleic acid DNA inside the nucleus, then it transfers into the cytoplasm to be used in building (synthesizing) the proteins which the cell needs. • These proteins are responsible for : - Appearing the genetic traits. - Organizing the vital activities. DNA → Transcription → RNA → Translation → Protein

UNIT 1

Molecular structure :



For illustration only

***Bio-computer** : scientists in nanotechnology field reached that it is possible to use the deoxyribonucleic acid (DNA) in making biochips that can be used to make computers much faster than the current devices that rely on silicon chips. Also, their storage capacity will be million times greater than that of the current devices.*

Test yourself

Choose the correct answer :

(1) Which of the following substances contains nitrogen element and enters in the structure of RNA molecule ? .....

ⓐ Uracil. ⓑ Thymine. ⓒ Ribose. ⓓ Deoxyribose.

(2) Which of the following substances contains nitrogen element and enters in the structure of DNA molecule ? .....

ⓐ Uracil. ⓑ Thymine. ⓒ Ribose. ⓓ Deoxyribose.

(3) The molecular formula of deoxyribose sugar is .....

ⓐ $C_5H_{10}O_5$ ⓑ $C_6H_{12}O_6$ ⓒ $C_5H_{10}O_4$ ⓓ $C_6H_{12}O_5$

(4) "DNA consists of nucleotides", "DNA is responsible for transferring the genetic characters from the parents to the offsprings". .....

ⓐ the first statement is correct and the second statement is wrong.

ⓑ the two statements are correct and related.

ⓒ the two statements are correct and unrelated.

ⓓ the two statements are wrong.

CHAPTER 2

QUESTIONS ON LESSON Two

Nucleic Acids

The questions signed by measure the high levels of thinking.

Interactive test

First Multiple Choice Questions

1 The part that represents carbohydrates in the structure of RNA molecule is .....

(a) uracil. (b) ribose. (c) adenine. (d) deoxyribose.

2 The number of hydrogen atoms in the sugar that enters in the structure of DNA nucleotides is .....

(a) 4 (b) 5 (c) 10 (d) 12

3 The molecular structure of ribose sugar is .....

(a) $C_5H_{10}O_5$ (b) $C_5H_{12}O_6$ (c) $C_5H_8O_4$ (d) $C_5H_{10}O_4$

4 By using the following figure, which of the choices that are present in the table is correct ? .....

	(1)	(2)
(a)	Amino acids	Polypeptide chain
(b)	Polypeptide chain	Fatty acids
(c)	Nucleotides	DNA
(d)	DNA	Nucleotides

5 Nucleotides differ from each other in all of the following, except the .....

(a) building structure of sugar. (b) type of nitrogenous base.

(c) phosphate group. (d) site.

6 The number of nucleotides that are common between DNA molecule and RNA molecule is .....

(a) zero. (b) 3 (c) 4 (d) 5

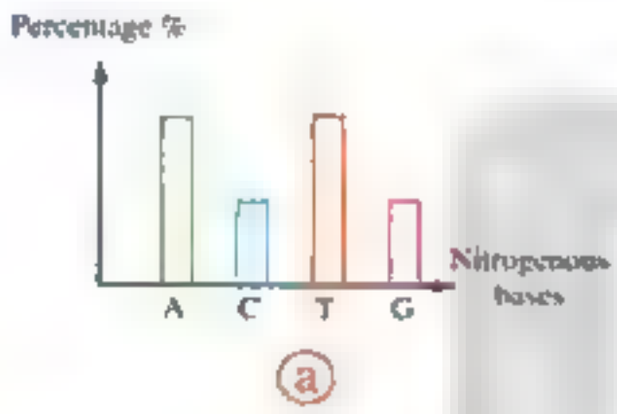
UNIT 1

7 If you know that adenine (A) binds with thymine (T), and guanine (G) binds with cytosine (C) in the double helix of DNA, in the light of this, answer :

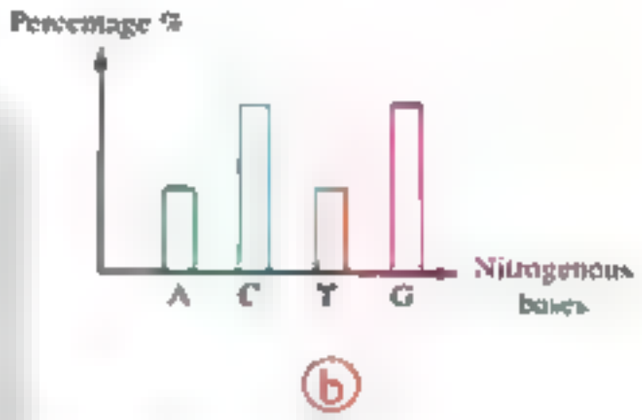
(1) The percentage is equal between each of the .....

ⓐ adenine and guanine.
ⓑ thymine and cytosine.
ⓒ adenine and thymine.
ⓓ (a) and (b) together.

(2) Which of the following graphs doesn't express DNA structure according to the nitrogenous bases ? .....



ⓐ



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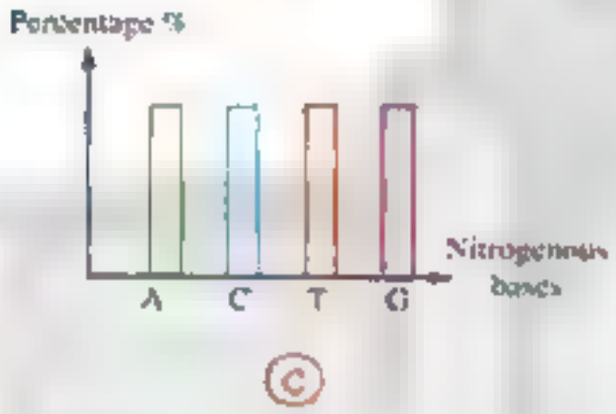

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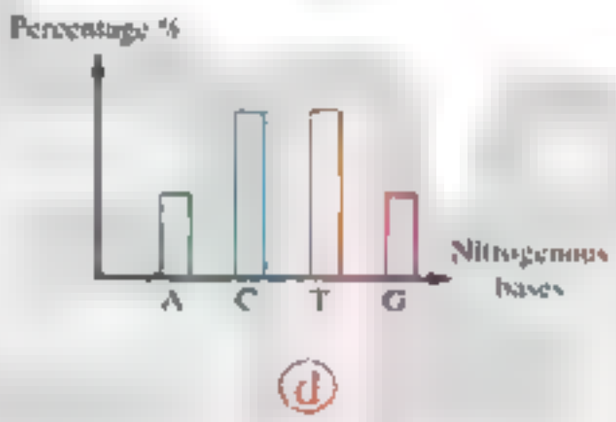
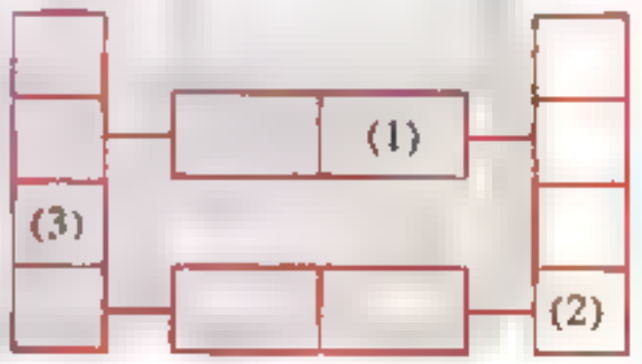


ⓓ

8 The opposite diagram expresses a part of the nucleic acid (DNA), what do the numbers (1), (2) and (3) represent respectively ? .....



ⓐ Pentose sugar / Nitrogenous base / Phosphate group.
ⓑ Pentose sugar / Phosphate group / Nitrogenous base.
ⓒ Nitrogenous base / Pentose sugar / Phosphate group.
ⓓ Nitrogenous base / Phosphate group / Pentose sugar.

9 The nitrogenous base (T) is similar to the nitrogenous base (U) in the .....

ⓐ site.
ⓑ structure.
ⓒ shape.
ⓓ sugar to which it binds.

10 Nucleotide containing adenine in DNA molecule differs from nucleotide containing adenine in RNA molecule in the number of .....

ⓐ carbon atoms.
ⓑ hydrogen atoms.
ⓒ oxygen atoms.
ⓓ phosphate groups.

11 If you know that corona virus (COVID-19) consists of nucleic acid (RNA), in the light of this, answer :

(1) The chemical formula of the sugar that is present in RNA nucleotides forming the virus is .....

ⓐ $C_5H_{10}O_5$ ⓑ $C_5H_{10}O_4$ ⓒ $C_6H_{12}O_6$ ⓓ $C_6H_{11}O_5$

(2) Which of the following contains nitrogen element in the components of RNA forming the virus ? .....

ⓐ Ribose. ⓑ Deoxyribose.

ⓒ Adenine. ⓓ Phosphate group.

12 All the following enter in the structure of the cell chromatin, except the .....

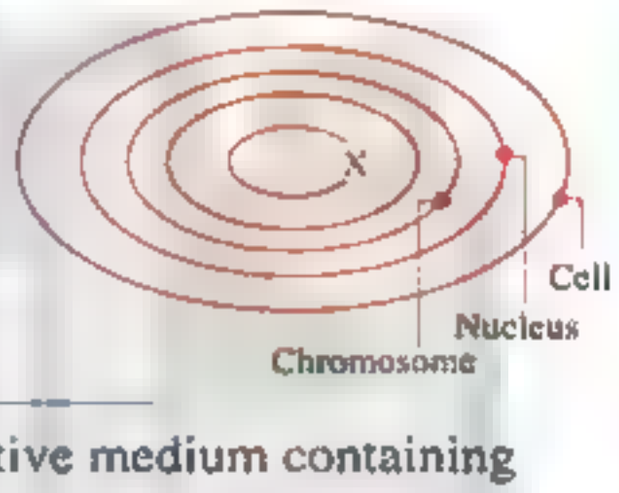
ⓐ amino acids. ⓑ RNA

ⓒ DNA ⓓ monosaccharides.

13 From the opposite diagrammatic figure, the part (X) represents .....

ⓐ nucleolus. ⓑ gene.

ⓒ nucleotide. ⓓ DNA



14 When a living cell from tobacco plant leaf grows in a nutritive medium containing the radioactive nitrogen element (^{15}N), we find that all the following structures contain the radioactive nitrogen, except the .....

ⓐ cell membrane. ⓑ cell wall.

ⓒ albumin of cytoplasm. ⓓ DNA

15 DNA is similar to thyroxine in the presence of ..... element.

ⓐ phosphorus ⓑ nitrogen ⓒ iodine ⓓ iron

16 Which of the following matche(s) with DNA in the elements that enter in its structure ? .....

ⓐ Cellulose. ⓑ Fats. ⓒ Phospholipids. ⓓ Haemoglobin.

17 Which of the following statements is wrong ? .....

ⓐ DNA is a double helix. ⓑ DNA contains thymine.

ⓒ RNA contains ribose sugar. ⓓ RNA is always a double helix.

UNIT 1

18 From the following figures, the numbers (1), (2) and (3) represent chemical bonds that bind between the molecules with each other, which are ..... respectively.

(a) peptide – covalent – covalent
(b) covalent – covalent – peptide
(c) covalent – peptide – covalent
(d) peptide – covalent – peptide

19 DNA molecule differs from RNA molecule in that .....
(a) DNA consists of a single strand and RNA consists of double strands.
(b) DNA contains 4 types of nucleotides and RNA contains 5 types of nucleotides.
(c) DNA is present inside the nucleus and RNA is present in the nucleus and cytoplasm.
(d) DNA contains uracil base and RNA contains thymine base.

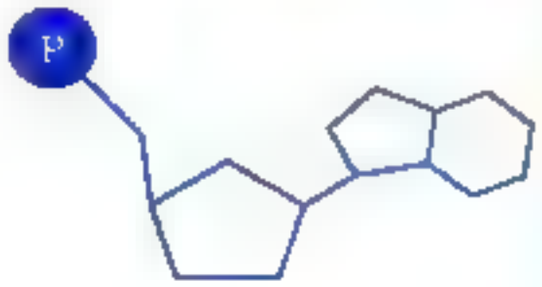
20 The genetic traits are transferred from the parents to the offsprings through the .....
(a) proteins that are present in the body cells.
(b) carbohydrates that are present in the body cells.
(c) sequences of nucleotides in RNA
(d) sequences of nucleotides in DNA

21 The appearance of the genetic traits occurs according to the arrangement : .....
(a) DNA ⟶ Protein ⟶ RNA
(b) Protein ⟶ RNA ⟶ DNA
(c) DNA ⟶ RNA ⟶ Protein
(d) RNA ⟶ Protein ⟶ DNA

22 Which of the following biological molecules is controlled directly by DNA ? .....
(a) Cholesterol.
(b) Glycogen.
(c) Phospholipids.
(d) Amylase enzyme.

23 A certain enzyme breaks down the covalent bonds that are present in DNA molecule, what happens on treating a nucleotide of DNA with this enzyme ? .....
(a) The nitrogenous base will separate from the nucleotide only.
(b) The phosphate group will separate from the nucleotide only.
(c) Each of the nitrogenous base and phosphate group will separate from the nucleotide.
(d) The components of nucleotide will not be affected.

24 What is the function of the polymer that is resulted from the combination of a number of monomers illustrated in the opposite figure ? .....



(a) Energy production.
(b) Entering in the formation of steroids.
(c) Carrying the genetic information of the living organism.
(d) Storage of energy.

Second Miscellaneous Questions

1 **From the opposite table, answer :**

Compound \ Element	Oxygen	Phosphorus	Nitrogen
(X)	✓	✓	✓
(Y)	✓	–	✓
(Z)	✓	✓	✓

(a) If the two compounds (X) and (Y) are from the same type of biological macro-molecules and the compound (Z) differs from them, **what** do you expect that each of (X) and (Y) represents ?
And what is the type of each one ?

(b) Deduce the name of compound (Z), if the compound :

1. Was a monomer for a biological macro-molecule complex.
2. Enters in the structure of the cell membrane.

---

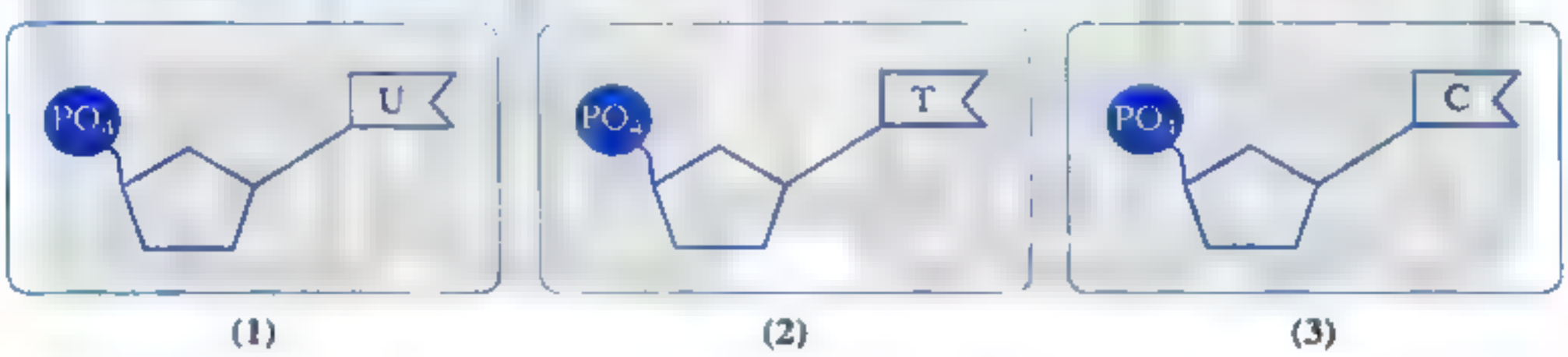
2 "The monosaccharide in RNA molecule is the building unit of starch". **How far this statement is correct ? With explanation.**

---

3 **Choose the anomalous word, then mention what links the rest :**
Glucose / Fatty acids / Amino acids / Nucleic acids.

---

4 **From the following figures :**



(1) (2) (3)

(a) Which of the previous figures represent(s) a nucleotide of the following nucleic acids, with explanation :

1. DNA 2. RNA 3. DNA and RNA

(b) What is the type of pentose sugar in each of figures no. (1) and (2) ?

---

5 "The sugar that enters in the structure of RNA molecule consists of 5 oxygen atoms". **How far this statement is correct ? With explanation.**

---

6 **Explain :** the difference of the type of chemical bonds among the nucleotides from the type of chemical bonds between amino acids with each other.

UNIT 1

7 **Write what this statement indicates :** "A part in the structure of building unit of nucleic acid in which the nitrogen element enters mainly in its structure and has five types".

8 **What happen if :** several nucleotides are linked together by covalent bonds ?

9 **The two following figures illustrate the building unit of the nucleic acid :**

(1) (2)

Which one of them represents the building unit of the nucleic acid RNA ? **And which** one of them represents the building unit of the nucleic acid DNA ? **Explain.**

10 **Write what this statement indicates :** "A monomer contains mainly the nitrogen and phosphorus elements".

11 **Explain :** the presence of nitrogen element in each of the proteins and nucleic acids.

12 **Explain :** the polynucleotide differs from the polypeptide.

13 **Mention the differences between :** RNA molecule **and** glycogen molecule in the human body.

14 **Mention the similarities and differences between :** the nitrogenous bases in each of the nucleic acid DNA **and** nucleic acid RNA

15 "We can differentiate between the nucleotides containing adenine and guanine in DNA molecule through the shape". **How far this statement is correct ? With explanation.**

16 **In the two opposite figures :**

(a) The structure (X) is different in the two figures (1) and (2), **explain this.**

(b) **Deduce** the components of the structure (Y).

(c) **What happens in case of :** the absence of the enzymes required to transcribe figure (2) from figure (1) ?

Figure (1) Figure (2)

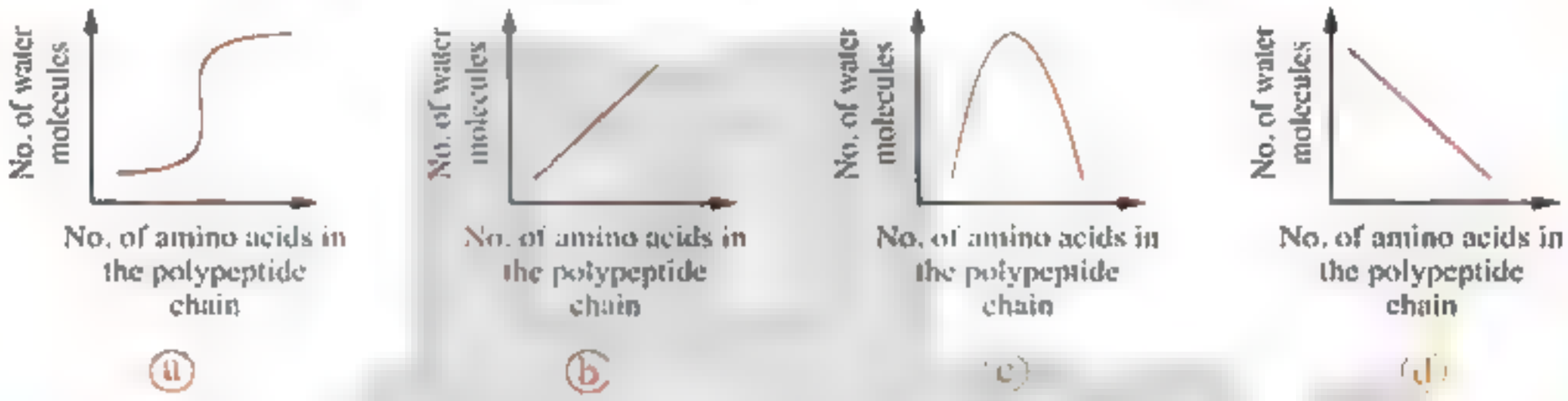
Model Exam on

Chapter 2

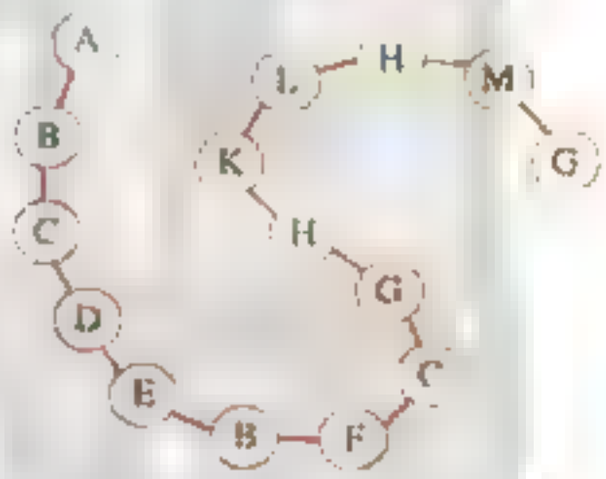
Chemical Structure of Living Organisms' Bodies (Proteins and Nucleic acids)

Choose the correct answer (1 : 10) :

1 Examine the following graphs that illustrate the relation between the number of amino acids in a polypeptide chain and the number of water molecules that are resulted on the formation of chain, which of them represents the polymerization reaction ? .....



The opposite figure represents a polypeptide chain, examine it, then answer :



2 The number of amino acids' types in this chain is .....

ⓐ 9 ⓑ 11

ⓒ 13 ⓓ 15

3 This chain contains ..... bonds.

ⓐ covalent and ionic ⓑ covalent and peptide

ⓒ peptide and ionic ⓓ peptide

4 Which of the following doesn't contain phosphorus element in its structure ? .....

ⓐ ATP ⓑ Thyroxine.

ⓒ Casein. ⓓ Nucleotide.

UNIT 1

5 The opposite figure illustrates a nucleic acid that is found in the living cell. From this figure, it is illustrated that this structure consists of .....

(a) three similar building units in the chemical structure.
(b) three different building units in the chemical structure.
(c) four similar building units in the chemical structure.
(d) four different building units in the chemical structure.

6 All the following contain nitrogen element in its structure, except the .....
(a) building unit of deoxyribonucleic acid.
(b) building unit of ribonucleic acid.
(c) building unit of albumin.
(d) building unit of starch.

7 Which of the following statements is correct ? .....
(a) In the cell, DNA consists of protein.
(b) Protein consists of DNA and is stored in the cell.
(c) DNA controls the formation of protein in the cell.
(d) The cell consists of DNA and protein.

8 Scientists thought that mitochondria resembles the independent cell, because it .....
(a) contains DNA
(b) contains RNA
(c) contains DNA and RNA
(d) doesn't contain DNA or RNA

9 Haemoglobin differs from thyroxine in all of the following, except the .....
(a) type of chemical bonds.
(b) number of amino acids.
(c) type of amino acids.
(d) order of amino acids.

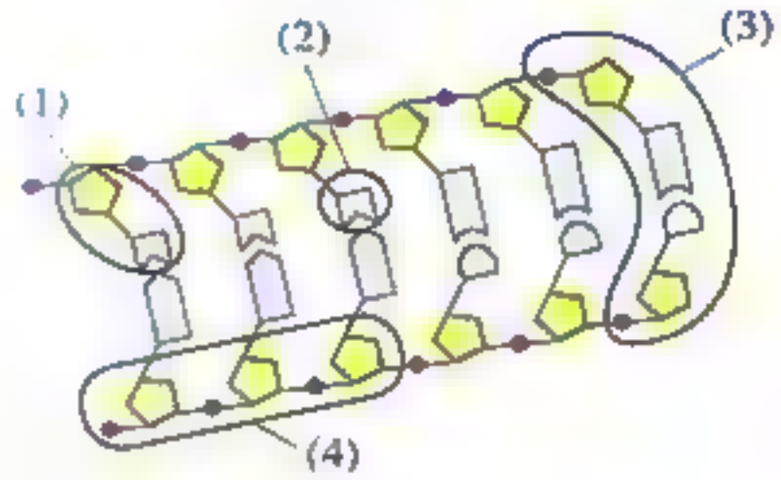
(10) The opposite figure illustrates a part of DNA. which of the following contains phosphate group ? .....

(a) (1) and (2).

(b) (1) and (4).

(c) (3) and (4).

(d) (2), (3) and (4).



Answer the following questions (11 : 17) :

(11) **Calculate** the number of water molecules that had been removed from 67 amino acids to form a polypeptide chain.

(12) **What happens if :** the cell loses its ability to synthesize the protein ?

(13) **What is the similarity between :** the amino acid "valine" and the nucleic acid "RNA" ?

(14) **What** is the normal sequence to form the protein in the cell ?

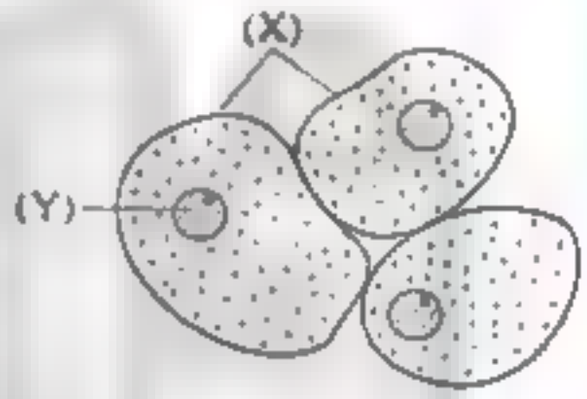
UNIT 1

15 **The process of proteins digestion in human occurs in the digestive system in the presence of specialized enzymes, in order to convert them into their building units which facilitates their absorption and making benefits from them, in the light of this, answer the following :**

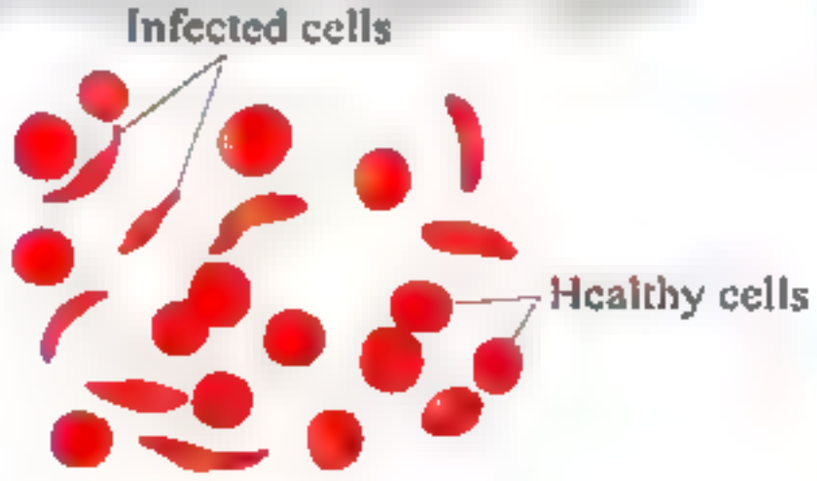
(a) **What** is the final product of this process ?

(b) **How** can the body cells make benefit from these building units ?

16 The opposite figure illustrates a group of animal cells. **In the light of your study, determine** which biological macro-molecule enters in the structure of (X) and (Y).



17 **The opposite figure illustrates the red blood cells of an infected person with sickle cell anemia that is from the genetic diseases resulted from the occurrence of a disturbance in the gene that is responsible for forming the protein of red blood cells. Determine each of the following :**



(a) The polymer in which the disturbance occurred.

(b) The element that enters in the structure of protein in which the disturbance occurred.

CHAPTER 3

Chemical Reactions in Living Organisms' Bodies

Metabolism

- Metabolism is a group of continuous biochemical reactions that take place inside the living cells, and its stop leads to the death of the living organism.
- Metabolic processes are divided into :

Catabolism	Anabolism
A process of breaking the chemical bonds among the atoms of macro-molecules to extract the chemical energy that is stored in them.	A process of using the simple molecules to build up more complex substances throughout a chain of reactions that consume energy.
Examples	
Releasing the energy that results from the glucose oxidation (during cellular respiration process).	Synthesis of proteins from the amino acids.

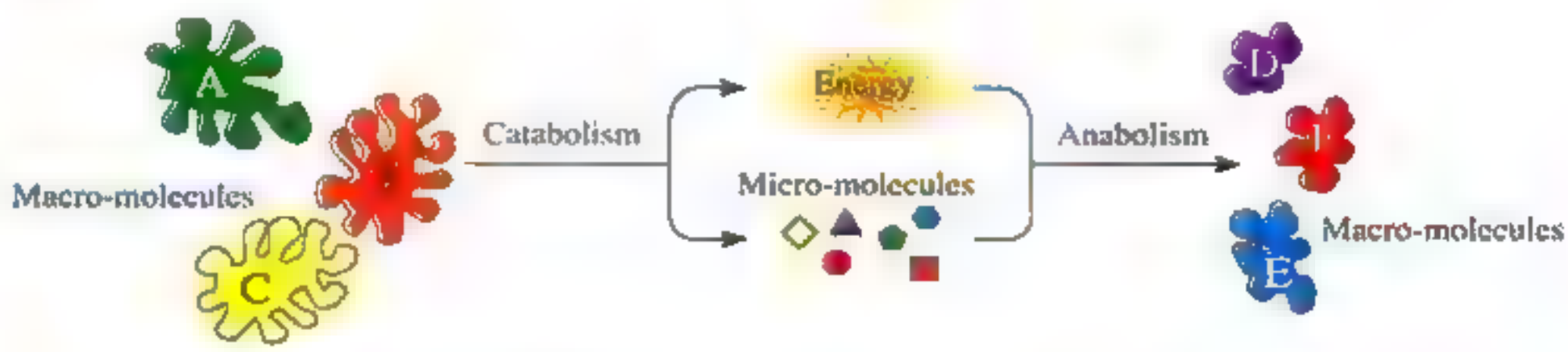


Diagram illustrates metabolism (anabolism and catabolism)

UNIT 1

Importance of metabolism

1. Growth of the body and repairing the damaged tissues (anabolism).
2. Obtaining energy required for performing the vital activities of the cell (catabolism).

Test yourself

1 Choose the correct answer :

Anabolic and catabolic processes. .....

ⓐ the first process is polymerization and the second process is oxidation.

ⓑ the first process produces energy and the second process consumes energy.

ⓒ the first process is oxidation and the second process is polymerization.

ⓓ they always occur in the same organelle of the living cell.

2 What happens if : the catabolic process stops in the living organism's cells ?

.....

.....

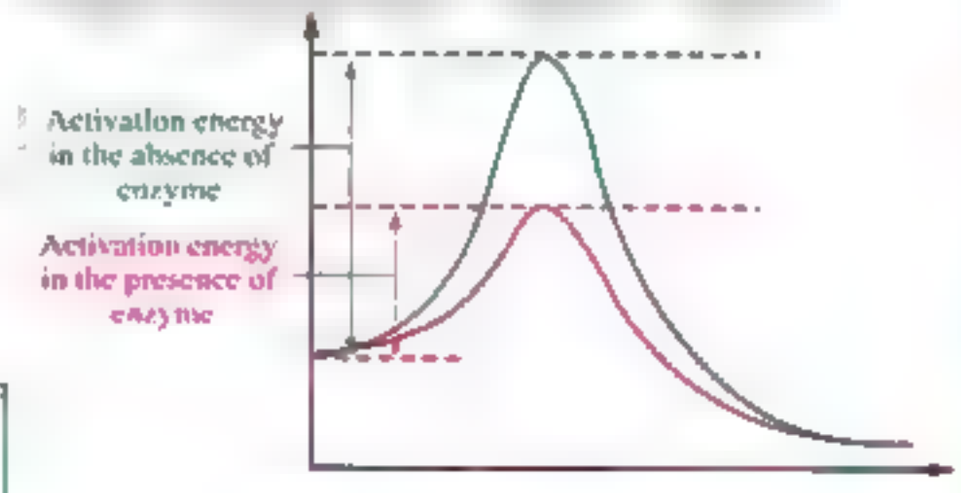
Enzymes

- In order for the biochemical reactions to occur in the cell, they need to a high **activation energy** to be started, where the activation energy is the minimum energy needed to start the chemical reaction and to reduce the cell consumption of more energy, there should be a **catalyst (enzyme)** to insure the occurrence of the chemical reaction rapidly.

Enzymes

They are the biological catalysts that consist of large protein molecules which work on increasing the speed of the chemical reactions inside the cell.

- The opposite graph illustrates the consumption of a biochemical reaction (metabolic processes) to the energy in the presence and absence of the enzyme, where :



Effect of enzymes on the activation energy needed for starting the chemical reaction

Activation energy in the presence of enzyme is less than **Activation energy in the absence of enzyme**

Structure of the enzyme

- The enzyme is made up of the combination of a large number of amino acids that form a chain or more of polypeptide which forms the specific spatial structure of enzyme.

Properties of the enzymes

1. Enzymes are similar to the other chemical catalysts, **because** they participate in the chemical reactions inside the cell to speed them up without being affected or consumed.
2. Enzymes are highly specific than other chemical catalysts, as each enzyme is specific for :
   - One reactant substance called **substrate (S)**.
   - One type or a few types of reactions.
3. Enzymes reduce the activation energy needed for starting the reaction.
4. Enzymes are affected in their action by the hydrogen ion concentration (pH) and temperature.

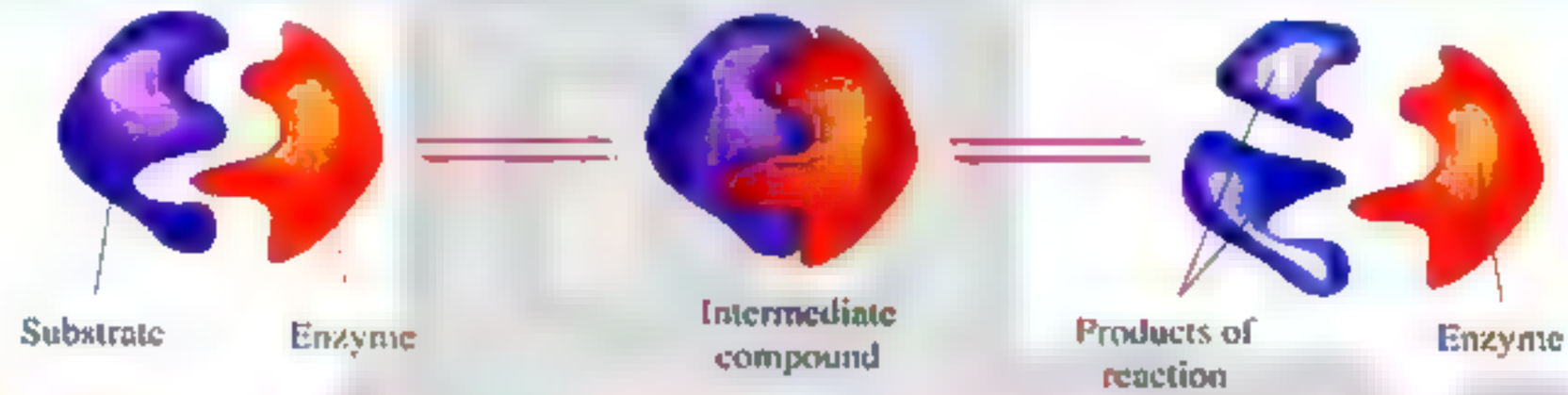


Diagram illustrates the mechanism of enzyme's action

2 Test yourself

Choose the correct answer :

(1) "All the enzymes are proteins", "All the proteins are not enzymes", ...

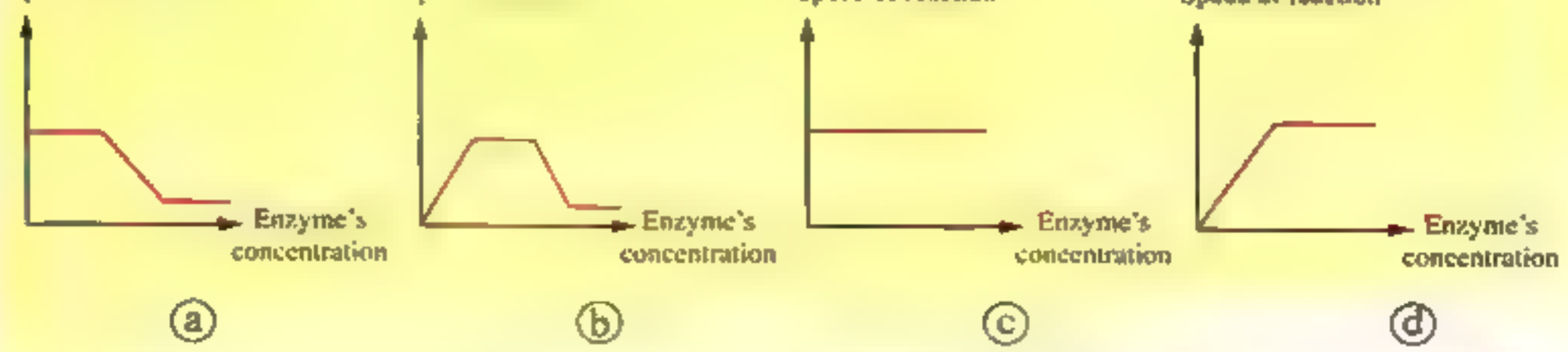
ⓐ the two statements are correct.

ⓑ the first statement is correct and the second statement is wrong.

ⓒ the first statement is wrong and the second statement is correct.

ⓓ the two statements are wrong.

(2) Which of the following graphs illustrates the relation between the speed of reaction and the enzyme's concentration ? .....



UNIT 1

Factors that affect the speed of enzyme's action

1. Temperature.
2. Hydrogen ion concentration (pH).
3. Enzyme's concentration.
4. Substrate's concentration.
5. Presence of inhibitors.

☆ The following is an illustration for the effect of each of the temperature and hydrogen ion concentration on the speed of the enzyme's action :

1 Temperature

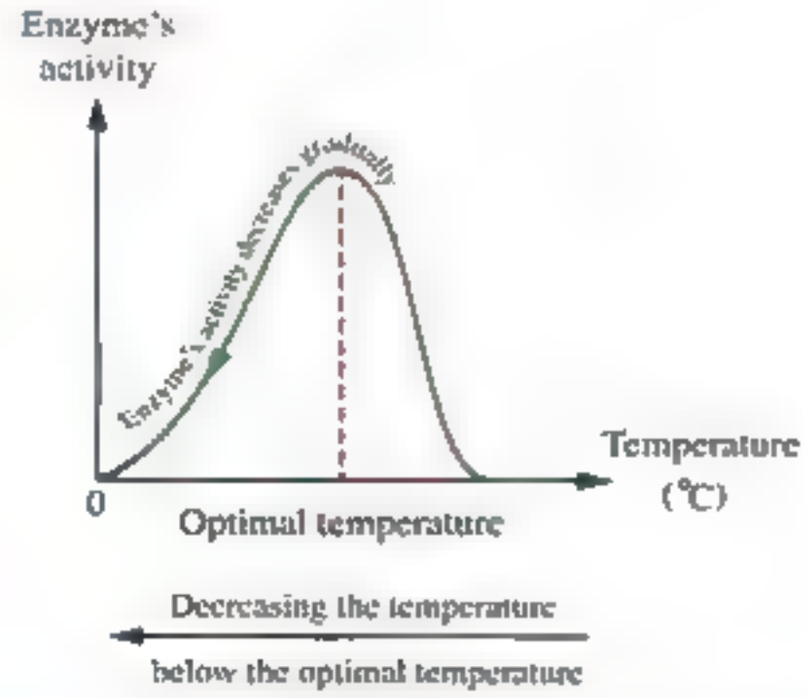
- Enzymes are sensitive to the thermal changes, because they are made up of protein substances, **so that** the enzyme's activity is determined by a narrow range of temperatures (comparatively to the ordinary chemical reactions).

As :

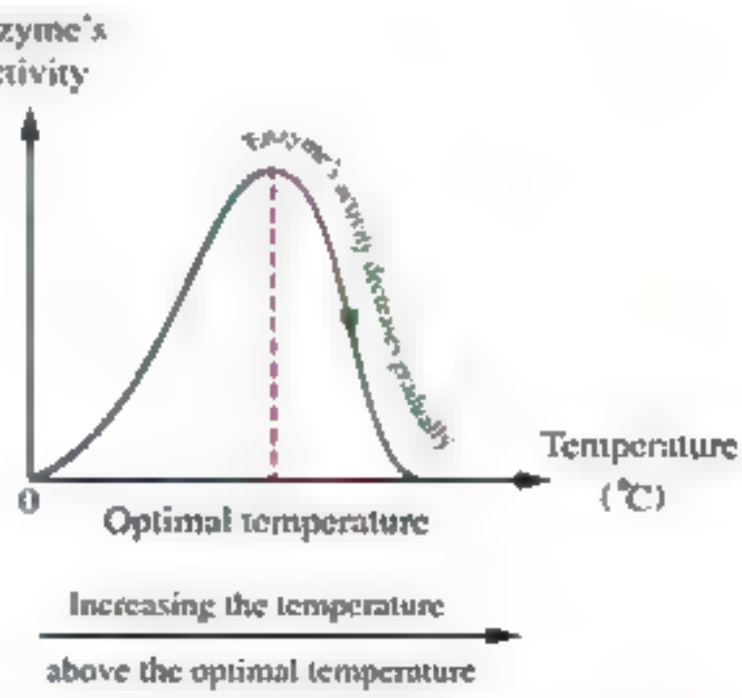
- Each enzyme has a certain temperature at which the enzyme is more active and called the "**optimal temperature**" which often ranges between 37°C to 40°C.

- The enzyme's activity decreases gradually, when :

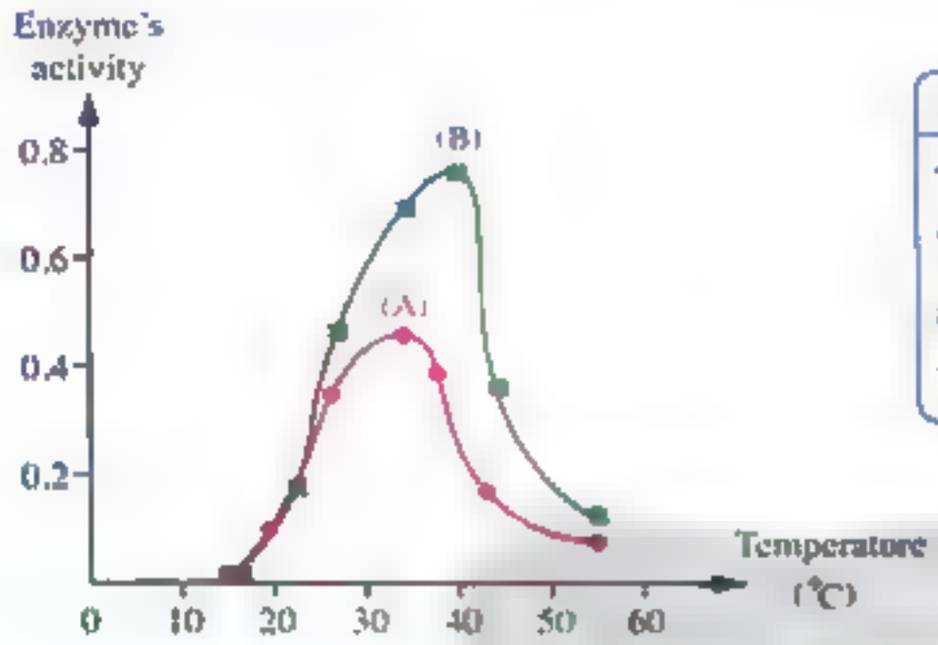
- The temperature decreases below the optimal temperature, until it reaches a **minimum temperature** at which the enzyme's activity is the lowest and it stops completely at 0°C, **but the enzyme restores its activity (gets reactivated) once more, on rising the temperature.**



- The temperature rises above its optimal temperature, until it reaches a certain temperature at which the enzyme's activity stops completely, due to the change of its natural composition (denaturation) **and the enzyme will not restore its activity, even after decreasing the temperature.**



• **Example : the following graph shows the relationship between the activity of two enzymes and temperature :**



The relationship between the temperature and the enzyme's activity

Note

The thermal range of the enzyme : is the range between the temperature at which the enzyme's activity starts and the temperature at which the enzyme's activity stops.

	Enzyme (A)	Enzyme (B)
Temperature at which the enzyme starts its activity (minimal temperature).	16°C	16°C
Temperature at which shows the maximum enzyme activity (optimal temperature).	35°C	40°C
Temperature at which the enzyme's activity stops.	55°C	55°C
The thermal range of the enzyme's activity.	16°C : 55°C	

Life application-:

Suitable temperatures are recorded on some clothes detergents to use them properly, **in order to** provide the optimal temperature at which the enzymes present in these detergents work with their maximum activity.

Test yourself

Choose the correct answer :

(1) Which of the following illustrates the relation between the temperature and the enzyme's activity ? .....

ⓐ The enzyme's activity increases by the continuous raising of temperature.

ⓑ The enzyme's activity decreases by the continuous raising of temperature.

ⓒ The enzyme's activity increases, then decreases by the continuous raising of temperature.

ⓓ The enzyme's activity decreases, then increases by the continuous raising of temperature.

UNIT 1

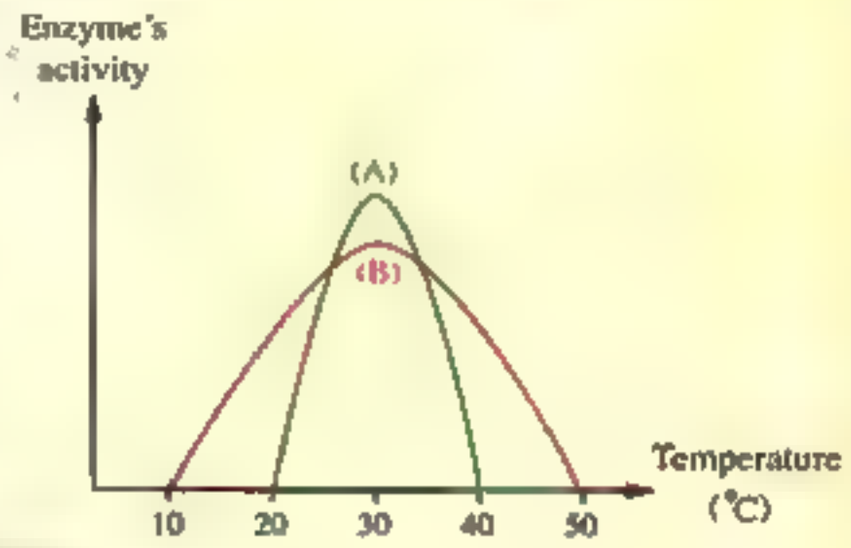
(2) "Each enzyme has an optimal temperature at which it is more active", in this light of this and by using the opposite graph, ...

ⓐ the thermal range of enzyme (A) is greater than that of enzyme (B).

ⓑ the thermal range of enzyme (B) is greater than that of enzyme (A).

ⓒ the minimal temperature of enzyme (B) is greater than that of enzyme (A).

ⓓ the optimal temperature of enzyme (A) is greater than that of enzyme (B).



2 Power of hydrogen (Hydrogen ion concentration) "pH"

- **Power "Potential" of hydrogen (pH) :** it is a measurement that determines the concentration of hydrogen ions (H^+) in the solution, in order to determine whether the solution is acidic, alkaline (basic) or neutral.
- **Solutions can be classified according to the hydrogen power (pH), as follows :**

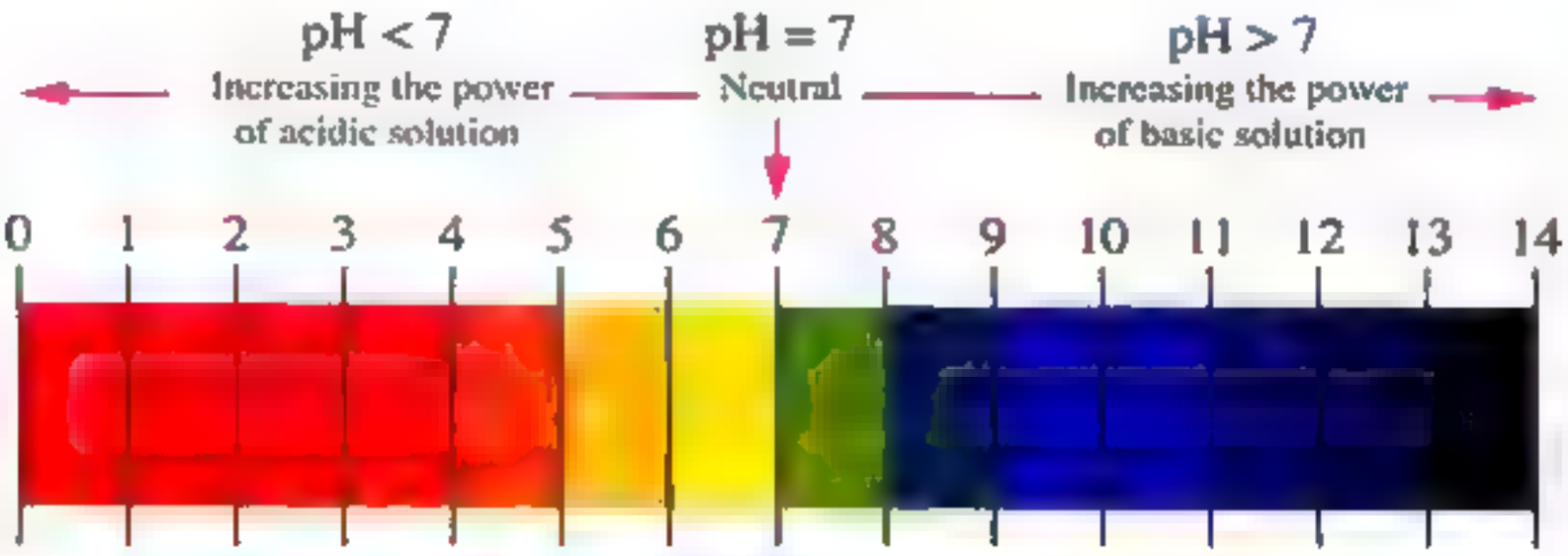
Acidic solutions	Neutral solutions	Alkaline solutions
The hydrogen power is less than 7 (pH < 7).	The hydrogen power is equal to 7 (pH = 7).	The hydrogen power is greater than 7 (pH > 7).

- The values of power of hydrogen of solutions range between (0 : 14), depending on the positive hydrogen ion concentration (H^+).

This is clear in the following figure :

Note

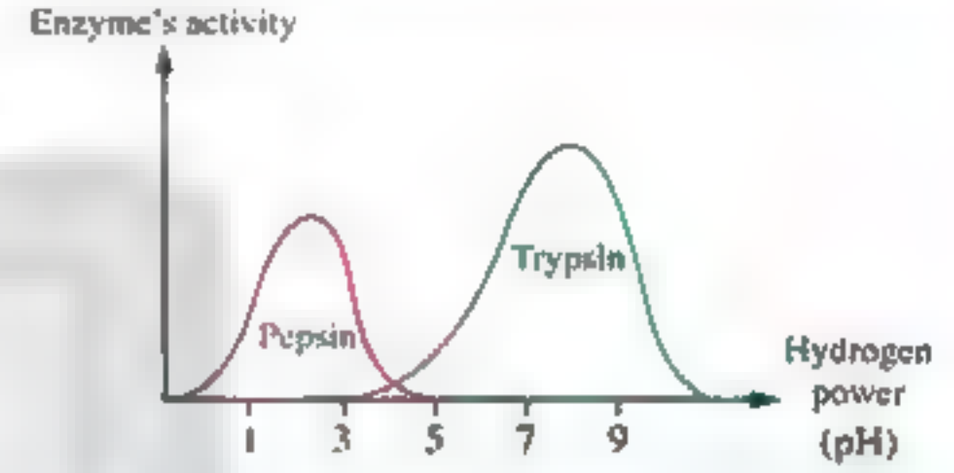
The neutral hydrogen power (pH = 7) equals the pH value of pure water at temperature (25°C).



The relationship of pH with the nature of solution

Relationship between pH and enzyme's activity

- **Enzymes are affected by changing pH values, because they are protein substances that contain :**
  - Acidic carboxyl groups (COOH).
  - Basic amino groups (NH_2).
- Each enzyme has an optimal pH value at which it works with a maximum efficiency, and if the pH is lower or higher than the optimal pH of the enzyme, the enzyme's activity decreases until it stops.
- **Examples :**
  1. Pepsin enzyme works in the stomach at acidic pH value ranging from (1.5 : 2.5).
  2. Trypsin enzyme works in the small intestine at basic pH value ranging from (7.5 : 8).



The optimal pH values for pepsin and trypsin enzymes

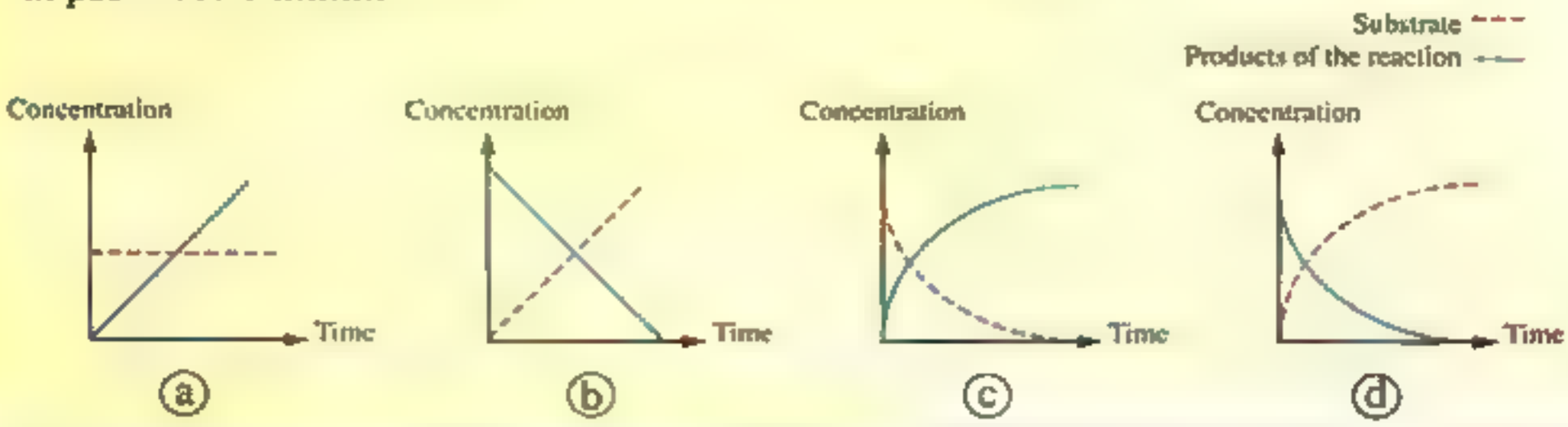
  3. Most enzymes work at pH value equals 7.4 (nearly neutral medium), as the amino acids molecules that form the enzyme contain acidic carboxyl groups (COOH) and basic amino groups (NH_2).

Test yourself

Choose the correct answer :

(1) A person ate a piece of meat, and after one hour from eating it, a chemical test was carried out on a sample of the stomach contents of this person, showing a decrease in the activity of pepsin enzyme, this is because .....
- (a) this person drank a cup of alkaline water.
- (b) the stomach contents temperature increases comparing with that of the body.
- (c) the amount of food that was eaten by this person was very little.
- (d) this person drank a cup of lemon juice.

(2) Which of the following graphs illustrates the relation between the change in the substrate's concentration and the products of the reaction when using an enzyme at pH = 7.4 ? .....



UNIT 1

Practical Activity 5 Effect of pH on the enzyme's activity

1. Used materials and tools :

- Amylase enzyme solution (5%).
- Starch solution (5%).
- Buffer solutions of different pH values.
- Iodine solution.
- Syringes (5 mL).
- 3 test tubes.
- Test tubes rack.
- Sticky papers.
- Pippete.
- Stop watch.
- Marker.

Note

Buffer solution : is a solution that keeps the solution's pH value constant at a certain value.

2. Procedures :

1. Numerate the tubes from (1) : (3).
2. Put 2 mL of amylase enzyme solution and 2 mL of starch solution in each tube by using the syringes.
3. Add to the tube :
   - No. (1) 1 mL of buffer solution (pH < 7.5).
   - No. (2) 1 mL of buffer solution (pH > 7.5).
   - No. (3) 1 mL of buffer solution (pH = 7.5).
4. To each tube, add equal drops of iodine solution.
5. Leave the tubes for a period of time and record your observations.

Note

The third tube represents the control experiment.

3. Observations and explanation :

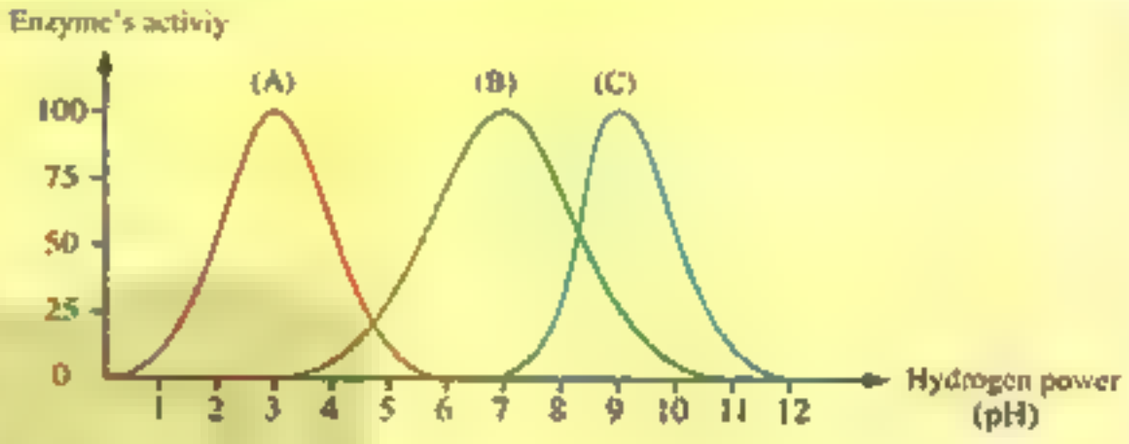
Tube no.	Observations	Explanations
(1) & (2)	Iodine solution colour changes into dark blue.	Iodine colour changes, because the amylase doesn't turn the starch into maltose. **i.e.** The values of (pH < 7.5) and (pH > 7.5) are not suitable for the enzyme's activity, because it works in a weak alkaline medium.
(3)	Iodine solution colour doesn't change.	Iodine colour doesn't change, because the amylase turns the starch into maltose. **i.e.** The value of (pH = 7.5) is suitable for the enzyme's activity.

4. Conclusion :

The enzyme's activity differs by changing the pH value, where the enzyme's activity decreases, when the pH is higher or lower than the optimal pH value at which the enzyme works well.

5 Test yourself

The opposite graph illustrates the effect of changing the hydrogen power (pH) on three enzymes that are extracted from different sites of the alimentary canal of a mammal at 40°C :



1 Explain why the experiment had been carried out at 40°C.

.....

.....

2 What happens in case of : the increase of pH value on the activity of enzyme (B) ?

.....

.....

.....

3 Choose : the nature of medium in which each of the two enzymes (A) and (C) works is ..... respectively.

ⓐ acidic and alkaline
ⓑ neutral and acidic
ⓒ alkaline and acidic
ⓓ neutral and alkaline

Science, Technology and Society

Nanobiopharmaceuticals

- Proteins have several vital roles inside the human body. Their ability to treat a lot of diseases and disorders inside the body has been discovered, where these biological macro-molecules (proteins) can be produced and used in treating some diseases, and these medicines are known as "**biopharmaceuticals**".

- **Disadvantages of biopharmaceuticals :**
  It is difficult to deliver these medicines directly to the target parts or cells in the body like several medicines.

- **The way to avoid the disadvantages of biopharmaceuticals :**
  After the enormous development resulted from the nanotechnology, many trials are done to deliver these biopharmaceuticals to the infected cells in the body by using "nanoparasites", leading to the arising of a new field called "nanobiopharmaceutics" and the products used in this field are called "nanobiopharmaceuticals".

QUESTIONS ON

CHAPTER 3

Chemical Reactions in Living Organisms' Bodies

The questions signed by measure the high levels of thinking.

Interactive test

First Multiple Choice Questions

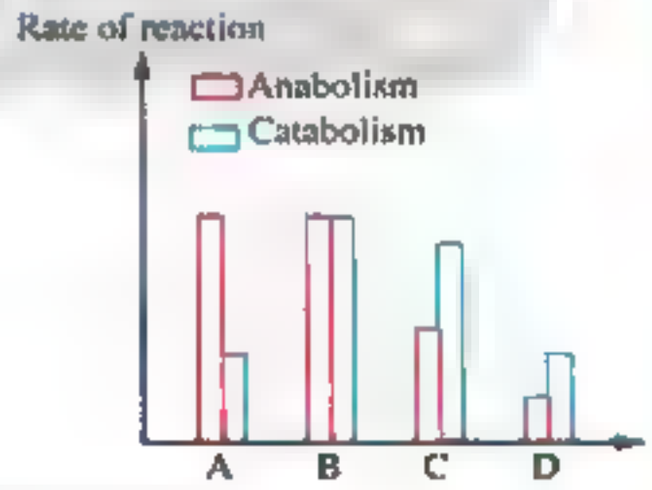
1 From the forms of the anabolic process inside the living organism is the .....
ⓐ oxidation. ⓑ decay. ⓒ polymerization. ⓓ digestion.

2 Which of the following statements expresses a characteristic of the catabolic process ? .....
ⓐ It aims to store energy inside the cell, till using it.
ⓑ It occurs in the plant cells, and it doesn't occur in the human cells.
ⓒ By which the energy that is required for performing the vital functions of the cell is obtained.
ⓓ It occurs in the human cells, and it doesn't occur in the plant cells.

3 The following figure expresses two processes that occur in a plant cell, what do these processes represent ? .....

ⓐ The process (2) is catabolism, and the process (1) is anabolism.
ⓑ The process (1) is catabolism, and the process (2) is anabolism.
ⓒ The both processes (1) and (2) are catabolism.
ⓓ The both processes (1) and (2) are anabolism.

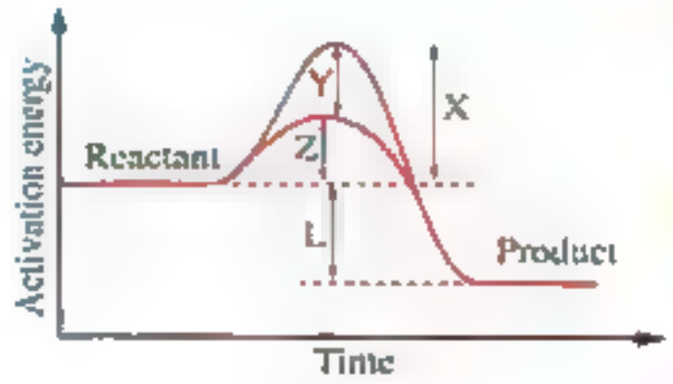
4 Which of the following shows the rate of the catabolism and anabolism for the cells of a 5-month-old child ? .....
ⓐ A
ⓑ B
ⓒ C
ⓓ D



5 All the following statements are correct, except that .....
ⓐ all the proteins are enzymes. ⓑ all the enzymes contain peptide bonds.
ⓒ all the enzymes are proteins. ⓓ all the proteins contain nitrogen element.

6 All the following statements are correct, except that .....
ⓐ some hormones consist of lipids. ⓑ some hormones consist of proteins.
ⓒ the enzymes consist of lipids. ⓓ the enzymes consist of proteins.

7 The opposite graph shows the effect of the enzyme on the activation energy of a chemical reaction. The arrow that illustrates the reduction of the activation energy, due to the addition of enzyme is .....

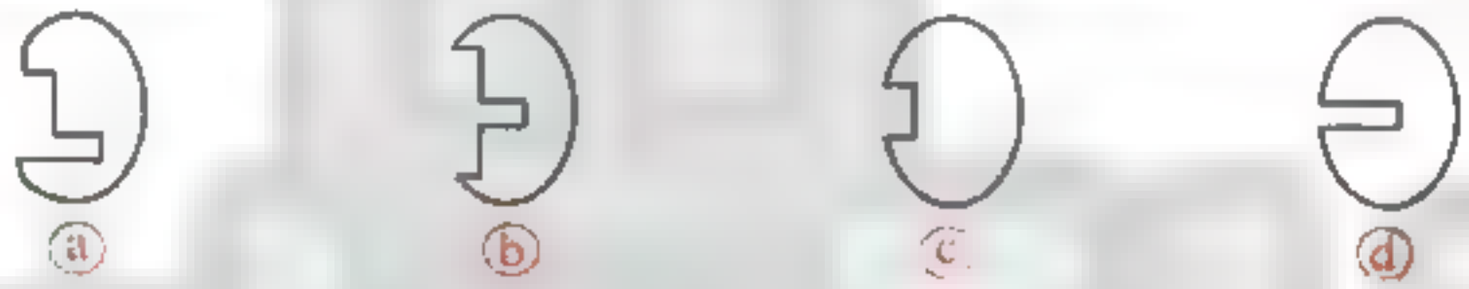


ⓐ X ⓑ Y
ⓒ Z ⓓ L

---

8 The following figure represents a chemical reaction :

Which of the following figures represents the enzyme in this reaction ? .....



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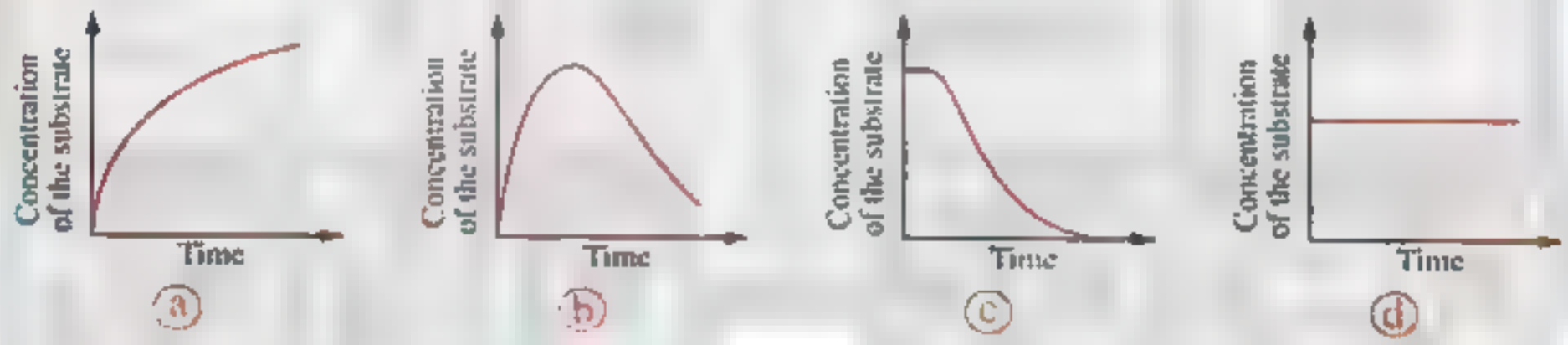
9 Which of the following graphs shows the concentration of the substrate on adding the enzyme to it ? .....



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10 In the enzymatic reaction in stomach, the product's concentration increases .....

ⓐ by increasing the concentration of inhibitors.

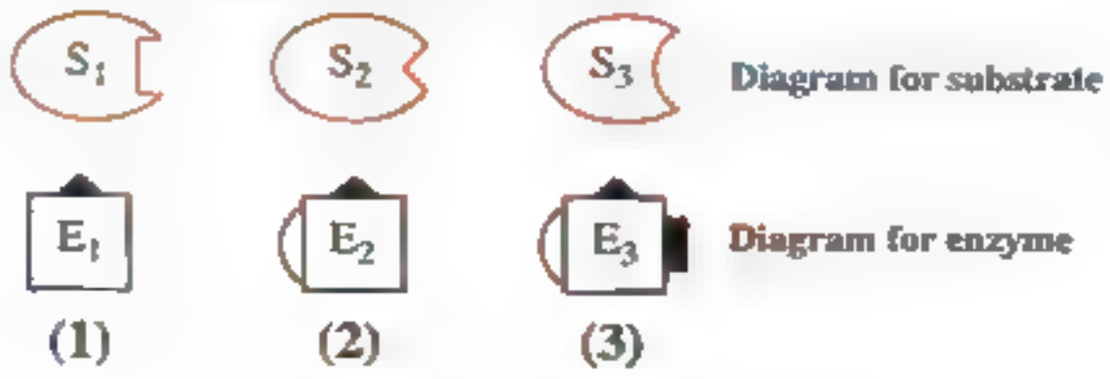
ⓑ by increasing the concentration of hydrogen ion.

ⓒ by increasing the substrate.

ⓓ when the concentration of the enzyme decreases at the normal body temperature.

---

11 Study the following figure, then answer :



UNIT 1

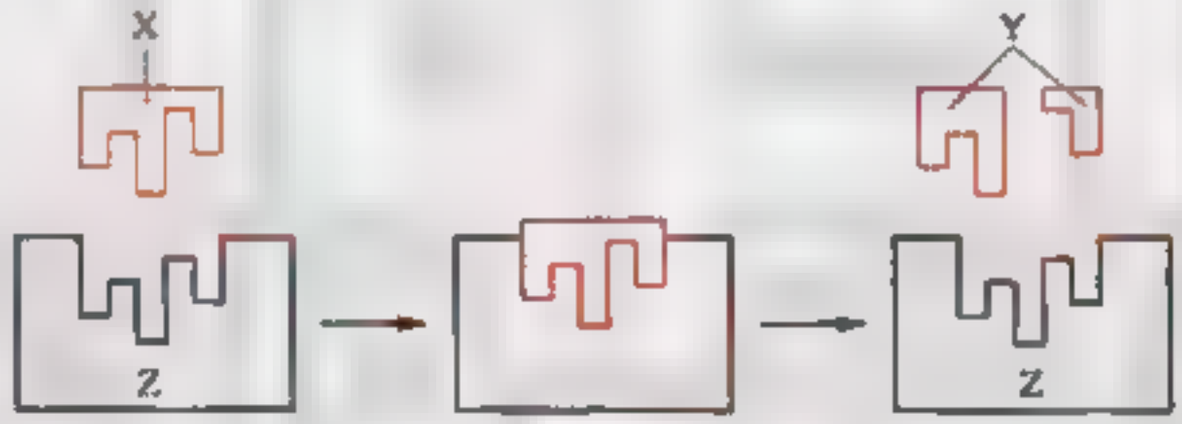
Which of the following statements is correct about the enzymes that are present in the diagram ? .....

(a) The enzyme no. (1) is less specific than the enzyme no. (3).
(b) The enzyme no. (1) is more specific than the enzyme no. (3).
(c) The enzyme no. (2) is less specific than the enzyme no. (3).
(d) All these enzymes are highly specific.

12 If you know that the amylase enzyme helps in starch digestion in mouth, therefore the activation energy needed to hydrolyze starch on adding the enzyme .....
(a) increases. (b) is not affected. (c) decreases. (d) vanishes.

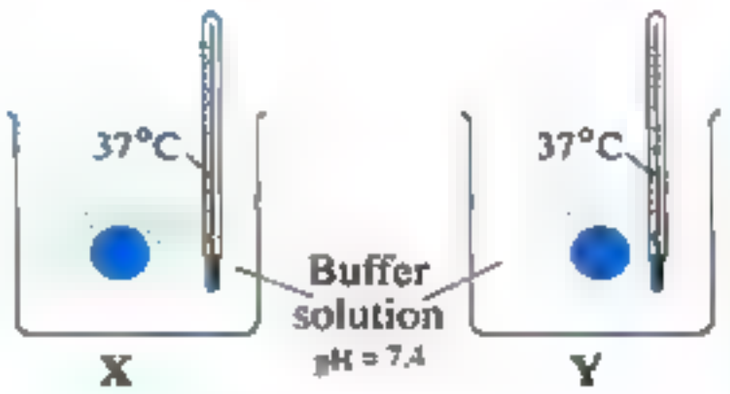
13 On trying to carry out the enzymatic reaction in lab without using the enzyme required for the reaction, therefore the reaction will .....
(a) not occur, due to the absence of enzyme. (b) occur and give different results.
(c) occur and takes much more time. (d) occur with a faster rate.

14 The following figure represents a model for the action of an enzyme inside the human body, which of the following statements represents the letters (X), (Y) and (Z) respectively ? .....



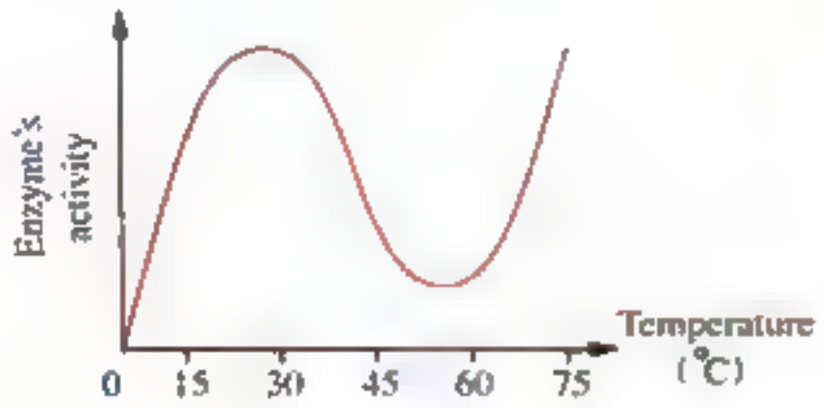
(a) Enzyme / Products / Substrate.
(b) Enzyme / Substrate / Products.
(c) Substrate / Enzyme / Products.
(d) Substrate / Products / Enzyme.

15 The reason for decreasing the enzyme's activity in figure (Y) than figure (X) is the .....
(a) substrate's concentration.
(b) temperature.
(c) presence of inhibitors.
(d) change of pH



16 If the thermal range for an enzyme's activity was (10°C : 40°C), it is probably that the maximum activity of this enzyme is at ..... °C.
(a) 10 (b) 30 (c) 40 (d) 50

17 Which of the following graphs illustrates the correct relation between the temperature and the activity of an enzyme ? .....



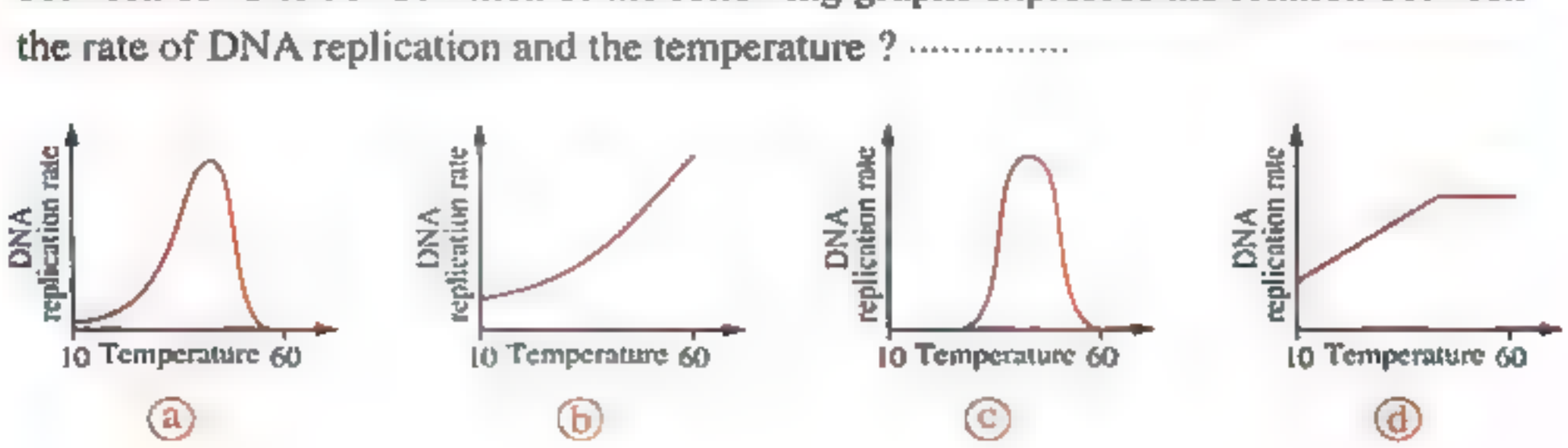
18 A student carried out an experiment, where he added amylase enzyme to 6 test tubes which each one contains an equal amount of starch solution, then he recorded the time taken for the completely hydrolysis of the starch by using iodine solution in the following table, based on the data recorded in the table :

Temperature °C	15	25	35	45	55	65
Time / sec.	35	22	13	5	35	66

The optimal temperature for the action of amylase enzyme is .....

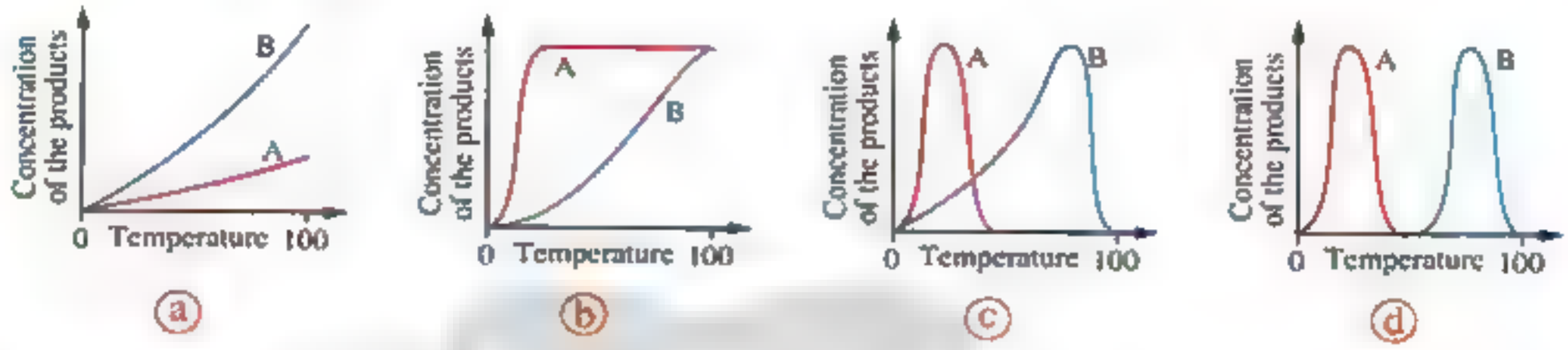
(a) 15 (b) 35 (c) 45 (d) 65

19 If you know that DNA polymerase enzyme is used in the replication of DNA, this enzyme is extracted from the bacteria that live in hot wells whose temperature ranges between 85°C to 95°C, which of the following graphs expresses the relation between the rate of DNA replication and the temperature ? .....



UNIT 1

20 If you know that enzyme (X) works at temperature ranging between 20°C to 50°C, while enzyme (Y) works at temperature ranging between 40°C to 85°C, which graph shows the relation between the products of the reaction (A and B) for two enzymes (X and Y) and the temperature ? .....



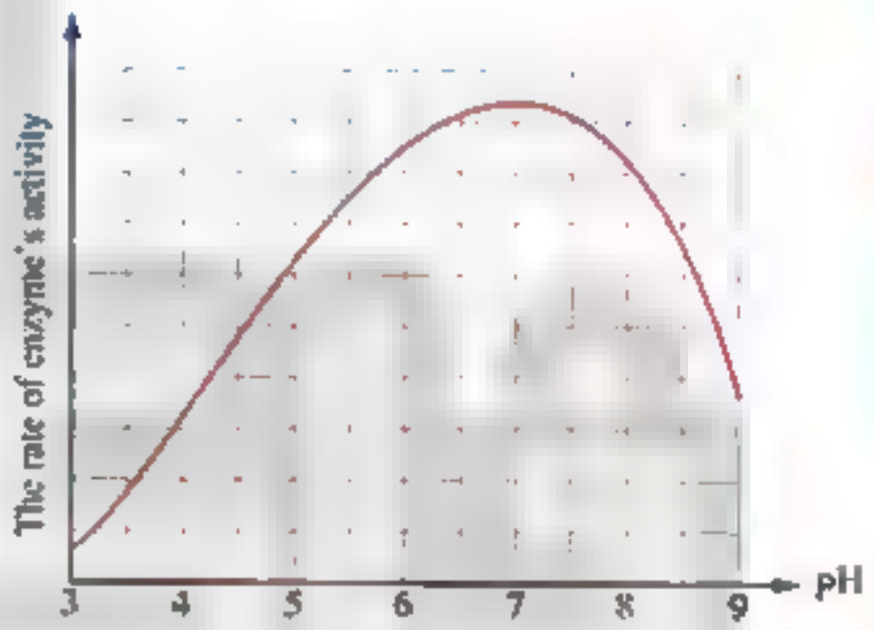
21 From the opposite graph that illustrates the effect of pH on the activity of an enzyme, we conclude that .....

ⓐ the enzyme is broken down when pH reaches (9).

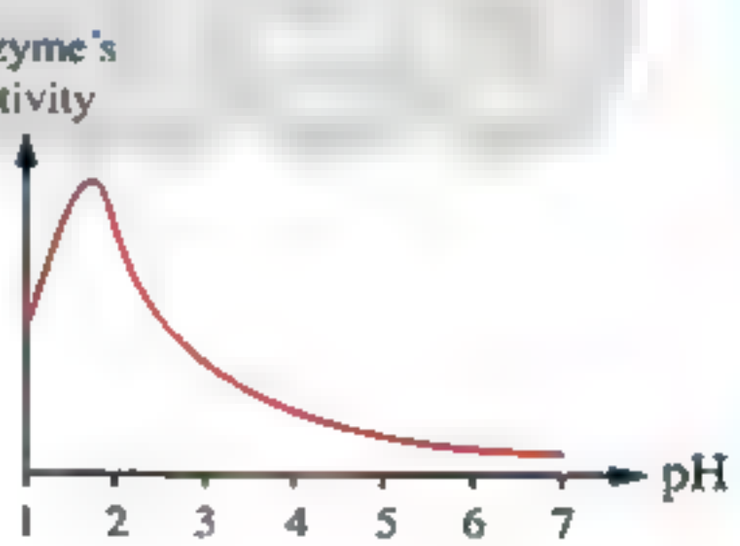
ⓑ the enzyme works with a high efficiency at pH = 6

ⓒ the rate of the enzyme's activity decreases to half, when pH changes from (5) to (7).

ⓓ the rate of the enzyme's activity is equal at pH values (5) and (8.5).



22 The opposite graph shows the relation between the hydrogen power (pH) and the activity of an enzyme, which of the following statements represents this graph ? .....



ⓐ This enzyme is not affected by the medium's type.

ⓑ This enzyme works with a maximum efficiency in the acidic medium.

ⓒ This enzyme works with a maximum efficiency in the neutral medium.

ⓓ This enzyme works with a maximum efficiency in the alkaline medium.

23 The opposite table shows the enzyme's activity for the action of three enzymes (A), (B) and (C) extracted from the digestive system of the human body, study it well, then answer :

pH	Activity of enzyme (A)	Activity of enzyme (B)	Activity of enzyme (C)
1	0	50	0
2	0	75	0
3	0	58	0
4	20	30	0
5	35	10	10
6	50	0	30
7	60	0	70
8	72	0	78
9	42	0	61
10	35	0	37

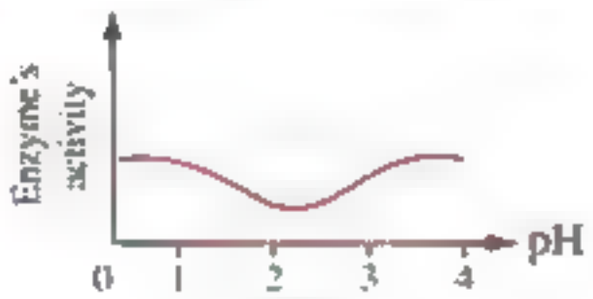
(1) What do you expect to be the enzyme (B) ?
And where does it work ? .....
(a) Trypsin – Small intestine.
(b) Pepsin – Stomach.
(c) Pepsin – Small intestine.
(d) Trypsin – Stomach.

(2) The medium in which each of the enzymes (B) and (C) works with a maximum activity is ..... respectively.
(a) basic – acidic (b) neutral – basic
(c) acidic – neutral (d) acidic – basic

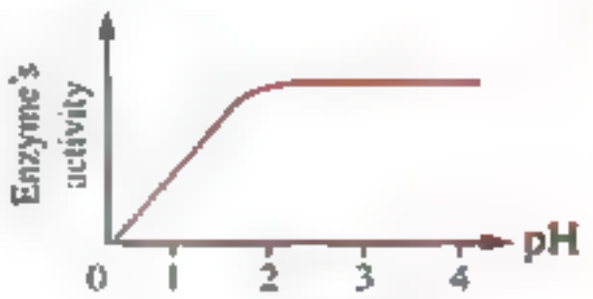
(3) The reason for stopping the activity of enzyme (A) in the region of the action of enzyme (B) is due to changing the .....
(a) site of reaction. (b) substrate's concentration.
(c) pH value. (d) enzyme's nature.

(4) The enzyme (A) is similar to enzyme (C) in the .....
(a) hydrogen ion concentration. (b) substrate's concentration.
(c) enzyme's concentration. (d) presence of inhibitors.

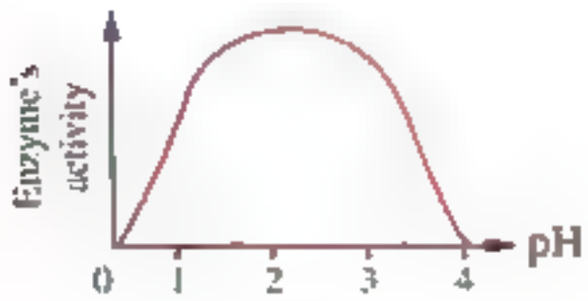
24 If you know that the pepsin enzyme helps in the digestion of proteins in stomach. Which of the following graphs illustrates what happens to the pepsin enzyme, if pH value increased in stomach ? .....



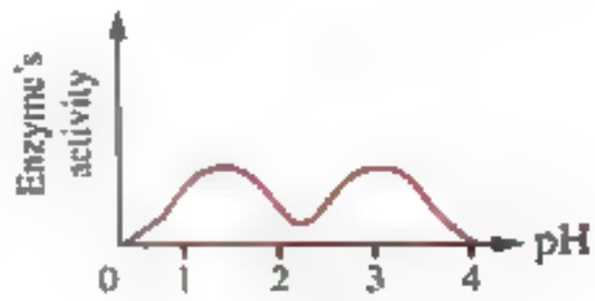
(a)



(b)



(c)



(d)

UNIT 1

25 In an experiment, the figure (1) represents the beginning of the experiment, where test tube containing starch solution and amylase enzyme was put in a water bath whose temperature is 55°C and the pH value equals 7.4, and the figure (2) represents this experiment after passing several hours, in the light of this, answer the following questions :

(1) (2)

(1) It is expected that the solution (X) contains .....

ⓐ starch. ⓑ starch and disaccharide.

ⓒ disaccharide. ⓓ disaccharide and amylase enzyme.

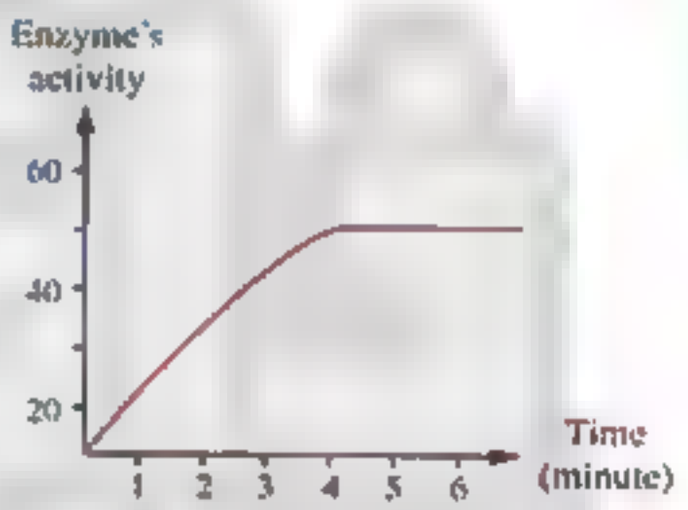
(2) After ending the experiment, the test tube was taken and put again in a water bath whose temperature is 35°C and with the same pH value, therefore it is possible that the solution (X) contains ..... , after passing several hours.

ⓐ starch ⓑ starch and disaccharide sugar

ⓒ disaccharide sugar ⓓ amylase enzyme and disaccharide sugar

---

26 A researcher studied the activity of an enzyme related to time, and the opposite graph represents the data that he obtained. In the light of this, answer :



(1) From the graph, we conclude that the enzyme's activity .....

ⓐ in the second minute is greater than that in the first minute.

ⓑ in the first minute is the same in the second minute.

ⓒ in the first and second minutes equals zero.

ⓓ is affected by increasing the inhibitors' concentration.

(2) The rate of change in the enzyme's activity can be estimated through .....

ⓐ estimating the change in enzyme's concentration.

ⓑ estimating the change in substrate's concentration.

ⓒ estimating the change in inhibitors' concentration.

ⓓ adding another amount of substrate.

(3) The change in the curve between the third minute and fifth minute can be explained, because of the .....

ⓐ change of enzyme's nature.

ⓑ arrival of enzyme to its maximum speed.

ⓒ consumption of a large amount of substrate.

ⓓ appearance of an enzyme's inhibitor.

(4) The least enzyme's activity is in the .....

ⓐ first and second minutes. ⓑ second and third minutes.

ⓒ third and fourth minutes. ⓓ fourth and fifth minutes.

---

27 On adding Biuret's reagent to a sample of substance (X), the colour of the solution turns into violet colour, after that the substance (Y) is added to another sample of substance (X) with drops of hydrochloric acid. After a half hour, the Biuret's reagent is added to this sample and the colour of the reagent is not changed. From your study, determine from the following table what the substances (X) and (Y) represent .....

	Substance (X)	Substance (Y)
ⓐ	Egg	Trypsin
ⓑ	A piece of meat	Pepsin
ⓒ	Milk	Trypsin
ⓓ	Corn oil	Pepsin

Second Miscellaneous Questions

1 **Give an example for :** a polymerization process in the plant cells.

---

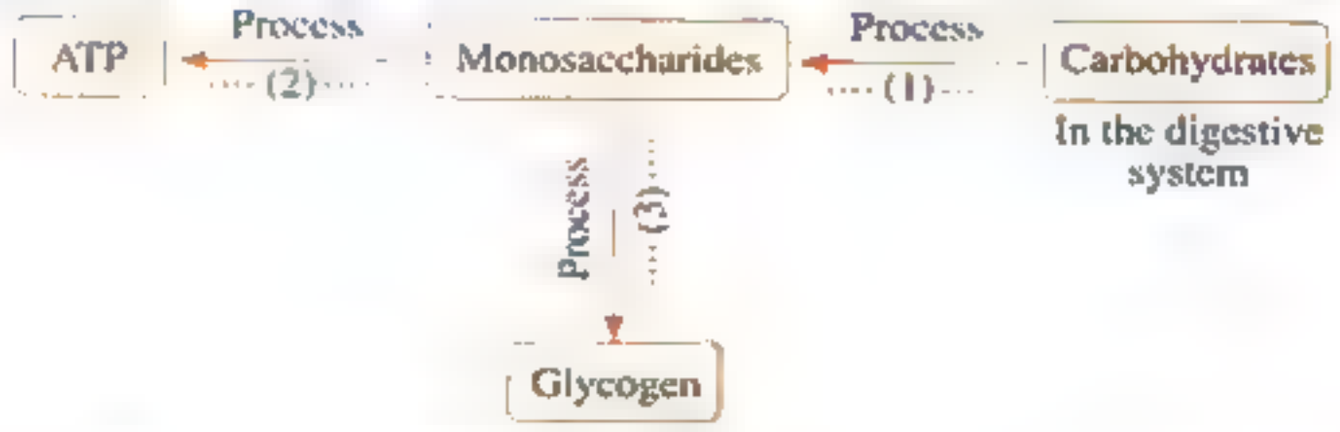
2 "The metabolic processes are contrasting".
How far this statement is correct ? With explanation.

---

3 The cell can accomplish the chemical reactions with a greater speed and less consumption of activation energy, **explain this.**

---

4 **Study the following diagram, then answer :**



(a) **What** is the name of processes no. (1), (2) and (3) ?

(b) **Where** do the two processes no. (2) and (3) occur inside the human body ?
And what is the importance of each one of them ?

(c) The process no. (3) depends on the process no. (2), **explain this.**

(d) From the previous diagram, **express** the fate of carbohydrates inside the human body.

UNIT 1

5 **When adding a solution that consists of several substances (X) to a piece of bread inside a test tube under certain conditions, monosaccharides are produced :**

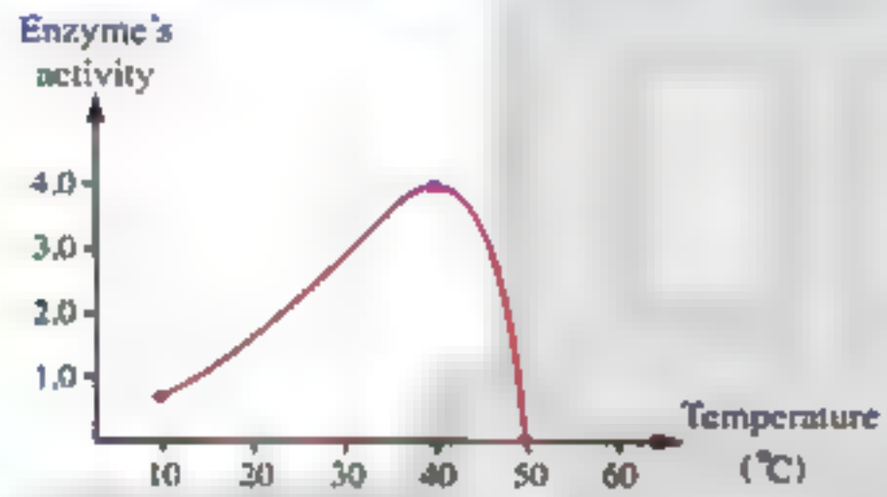
(a) **What** are the substances (X) ? **And what** is their importance ?

(b) **What** are these certain conditions during experiment ? **And what happens in case of** the occurrence of a change in these conditions ?

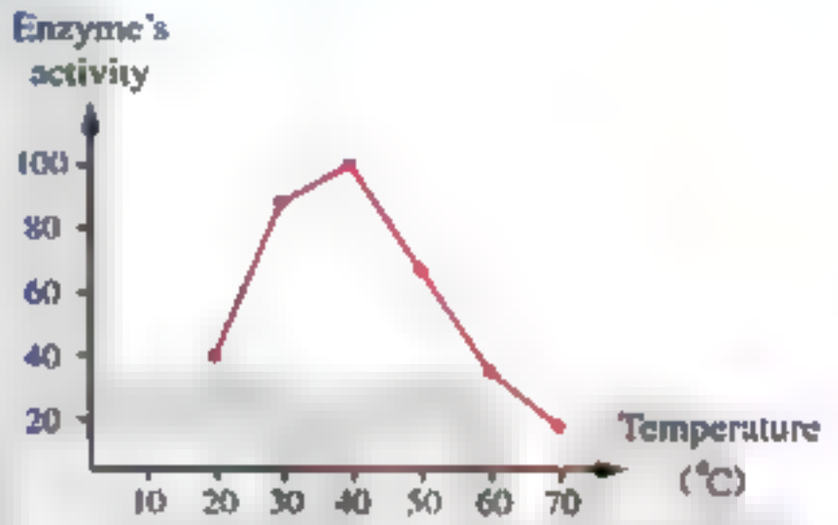
(c) **What are the similarities and differences between** the catalyst of the previous reaction and the other catalysts ?

---

6 **The two following graphs illustrate the relation between the activity of two enzymes (1 & 2) and the temperature :**



Enzyme (1)



Enzyme (2)

(a) Mention :

1. The temperature at which the activity of enzymes (1) and (2) starts.
2. The optimal temperature for the activity of enzymes (1) and (2).
3. The temperature at which the activity of enzymes (1) and (2) stops.
4. The thermal range for the activity of enzymes (1) and (2).
5. Two other factors affect the enzyme's activity.

(b) Give reason for : the sensitivity of each of the enzymes (1) and (2) to the thermal changes.

---

7 **Give reason for :** the suitable temperatures for using some clothes detergents are recorded on them.

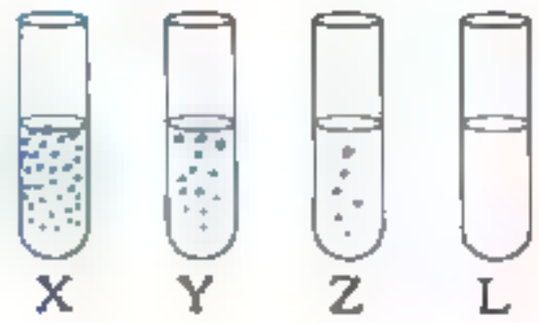
---

8 **What happen in case of :** decreasing the medium temperature at which the amylase enzyme works to 0°C ?

---

9 **The following figure contains a scientific error, mention it with explanation, then draw the correct figure :**

10 **The opposite figure shows an experiment to measure the effect of temperature on the activity of catalase enzyme (converts hydrogen peroxide into water and oxygen), where equal amounts of enzyme were added in 4 test tubes, each of them contains 2 mL of hydrogen peroxide, as shown in figure, and this occurs at different temperatures :**



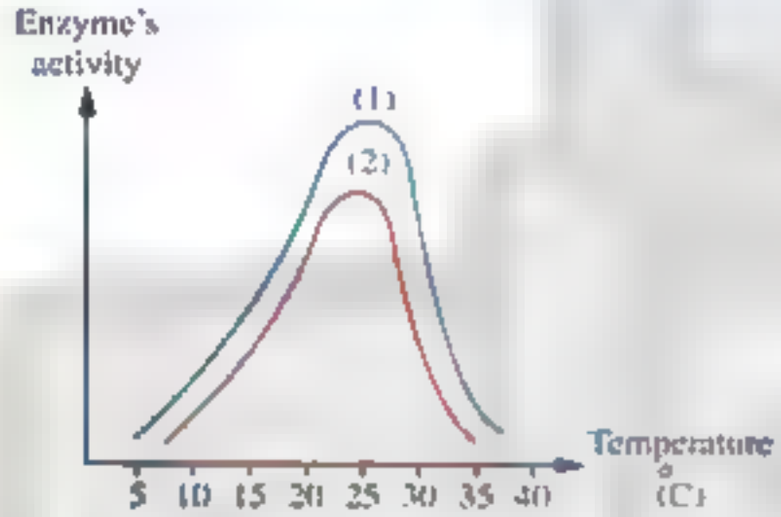
(a) Determine :

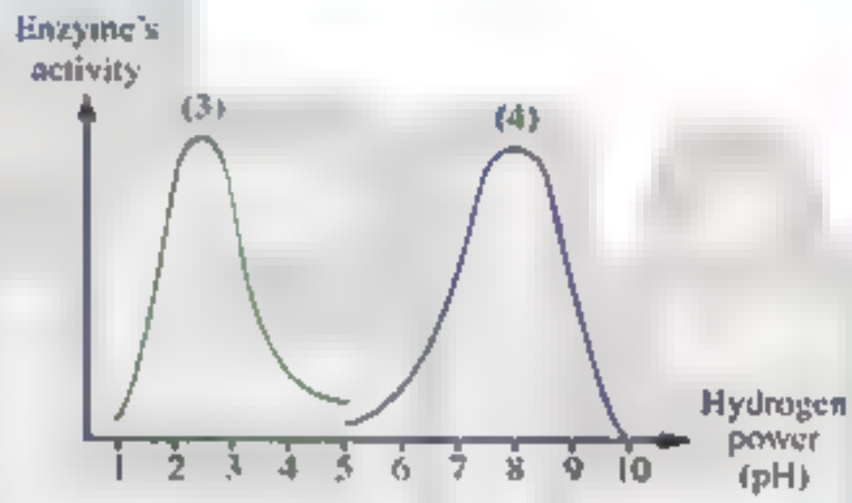
1. Which test tube could express the minimal temperature for the enzyme's action ?
2. Which test tube could express the temperature at which the enzyme's action stops ?
3. Which test tube could express the optimal temperature for the enzyme's action ?

(b) In the light of your study, **what** are the conditions needed for this experiment ?

---

11 **The two following graphs show the relation between the enzymes' activity and each of the temperature and hydrogen power value (pH) :**





(a) What is the optimal temperature for the enzyme no. (1) ?

(b) What is the thermal range for the enzyme no. (2) ?

(c) What is the optimal (pH) value for the enzyme no. (3) and (4) ? **And what** is the type of suitable medium for the action of each one of them ?

(d) In the light of your study, **what** does each of the enzymes no. (3) and (4) represent ? **And where** does each one of them work ?

---

12 **Give an example for a nutrient substance that is digested in :**

(a) Alkaline medium. **(b)** Basic and acidic medium.

---

13 **The following figures illustrate some digestion processes that may happen in stomach :**

UNIT 1

(a) **Which** of the previous digestion processes works better, after adding the pepsin enzyme to each one of them ? **And why ?**

(b) **Why** don't the other digestion processes occur ?

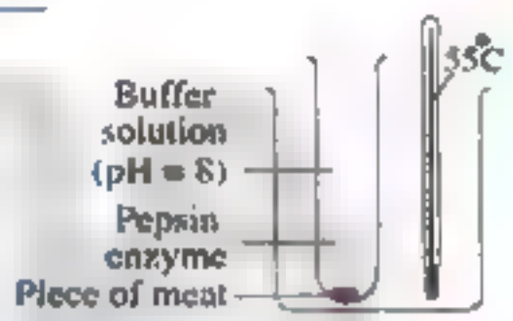
14 "Pepsin enzyme that works in the small intestine needs a buffer solution whose pH value equals 1.5, in order to work with a maximum efficiency".
How far this statement is correct ? With explanation.

15 **What happens in case of :** increasing the acidity of stomach above the optimal value for the action of its enzymes ?

16 "In the reactions of the trypsin enzyme, a neutral buffer solution is used to prepare the medium for the enzyme action". **How far this statement is correct ? With explanation.**

17 "At the normal conditions in lab, the enzyme is used directly with the substrate to perform its action". **How far this statement is correct ? With explanation.**

18 **If you know that the pepsin enzyme works on digesting the proteins in stomach, study the opposite figure, then mention** the mistakes that are present in the figure, **and correct** them.



19 **The following table shows some enzymes that work in different regions in the digestive system of human and the suitable hydrogen power for the action of each one of them, answer the following :**

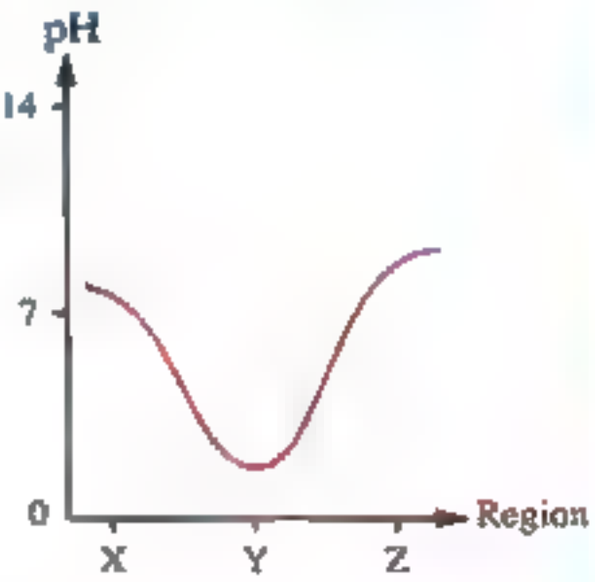
Site of enzyme	Enzyme	pH range	Type of medium
Mouth	Amylase	7 : 7.5	..... (1) .....
Stomach	Pepsin	1.5 : 2.5	..... (2) .....
Small intestine	Pancreatic amylase – Trypsin – Lipase	7.5 : 8	..... (3) .....

(a) **Complete** the previous table.

(b) **Predict** the change in salivary amylase enzyme's activity, when it moves from mouth to stomach. **Explain your answer.**

(c) **Predict** the change in pepsin enzyme's activity, when it moves from stomach to small intestine. **Explain your answer.**

(d) If the previous table is replaced by the opposite graph, **what happens if** a disturbance occurred in the secretions of region (Y) ? **Illustrating this graphically.**



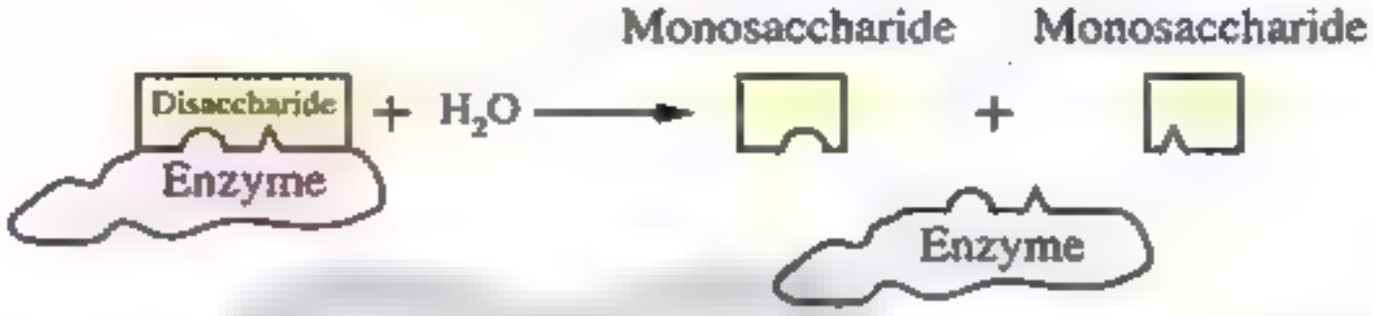
Model Exam on

Chapter 3

Chemical Reactions in Living Organisms' Bodies

Choose the correct answer (1 : 10) :

Study the following figure, then answer :



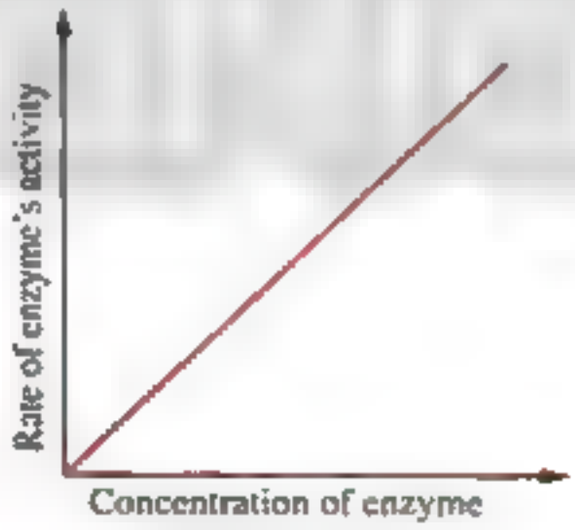
1 The enzyme's activity in the chemical reaction that is illustrated in the figure increases by all of the following, except .....

(a) increasing the enzyme's concentration.
(b) increasing the disaccharide concentration.
(c) increasing the monosaccharide concentration.
(d) reaching the optimal temperature.

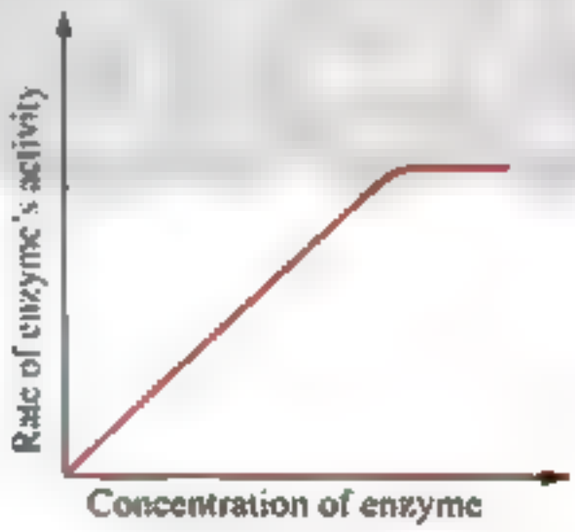
2 From the previous figure, we conclude that the enzyme is a(an) .....

(a) protein substance. (b) fatty substance.
(c) stimulator. (d) inhibitor.

3 Two students carried out an experiment to study the effect of the concentration of an enzyme on the rate of its activity, then each one of them represented the results that they obtained graphically as shown in the following graphs :



Student (1)



Student (2)

Which statement explains the difference that is illustrated in the experiment of the second student ? .....

(a) He added an inhibitor for the enzyme in the experiment.
(b) He carried out the experiment in a medium with high temperature.
(c) He used a different buffer solution.
(d) He used a lower concentration of the substrate.

UNIT 1

4 Which of the following processes is considered a catabolic process ? .....

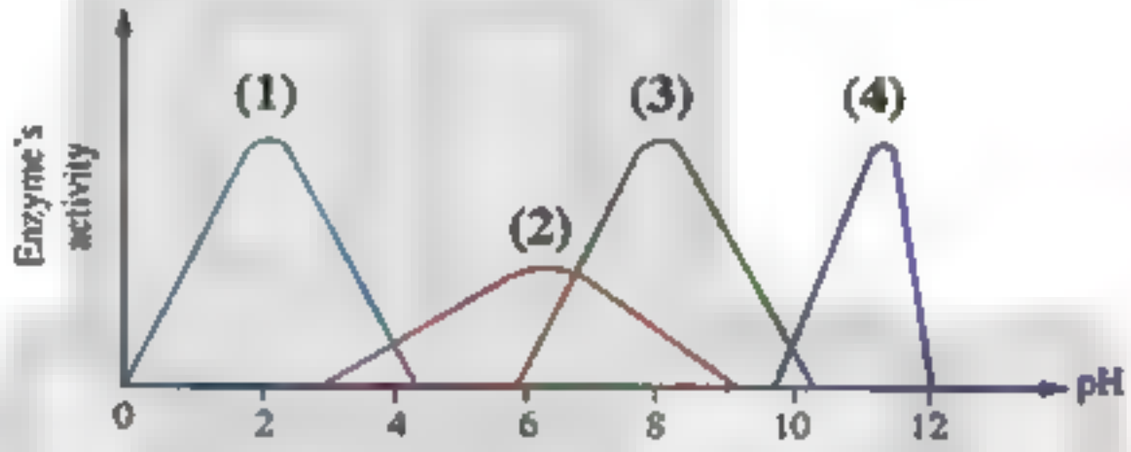
(a) The conversion of protein into amino acids in the small intestine.

(b) The conversion of glucose into carbon dioxide, water vapour and energy in the muscular cells.

(c) The conversion of glycogen into glucose in the muscular cells.

(d) The conversion of glucose into glycogen in the liver cells.

Study the following graph which represents the activity of four different enzymes in media with different pH values, study it, then answer :



5 Which one of these four enzymes whose activity stops in the small intestine ? .....

(a) (1). (b) (2). (c) (3). (d) (4).

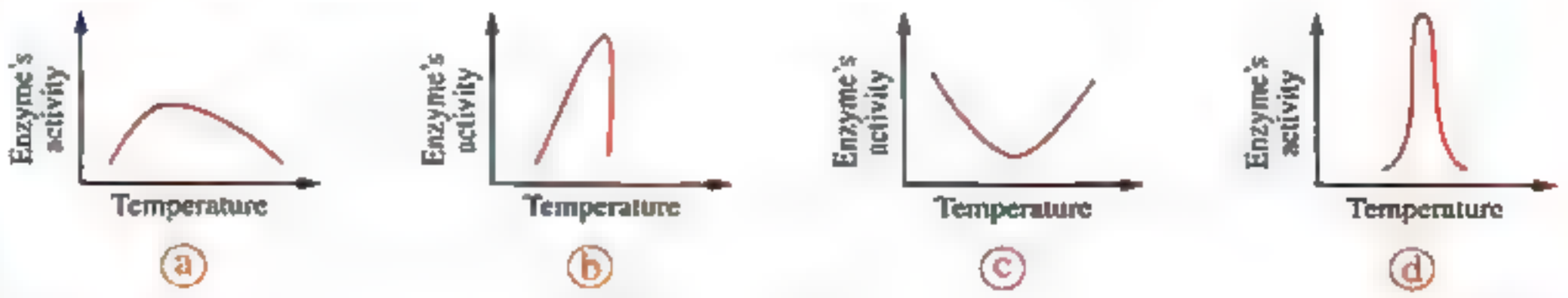
6 Which one of these four enzymes works with a maximum efficiency on digesting protein in the small intestine ? .....

(a) (1). (b) (2). (c) (3). (d) (4).

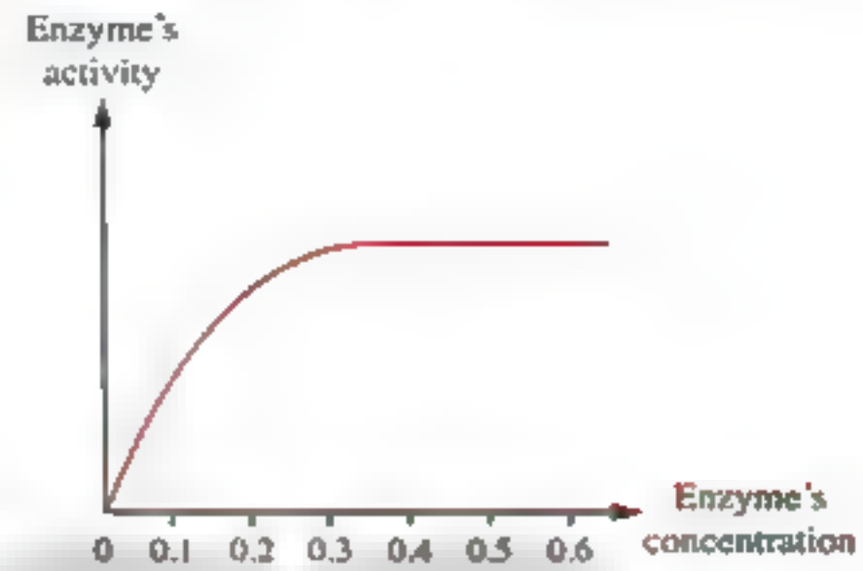
7 Which one of these four enzymes whose activity is affected by the occurrence of a slight change in pH value ? .....

(a) (1). (b) (2). (c) (3). (d) (4).

8 If you know that the enzyme (X) is more sensitive for the change in temperature. Which graph expresses the activity of this enzyme ? .....



The following graph shows the relation between the activity of a certain enzyme and its concentration in the medium, study it, then answer :



9 The maximum activity of this enzyme is at concentration equals .....

(a) 0.1 (b) 0.2 (c) 0.3 (d) 0.5

10 On increasing the concentration of substrate, it is expected that the maximum activity of this enzyme is at concentration equals .....

(a) 0.3 (b) 0.4 (c) 0.5 (d) 0.6

Answer the following questions (11 : 17) :

11 **Explain :** the biochemical reactions occur in the presence of specialized enzymes only.

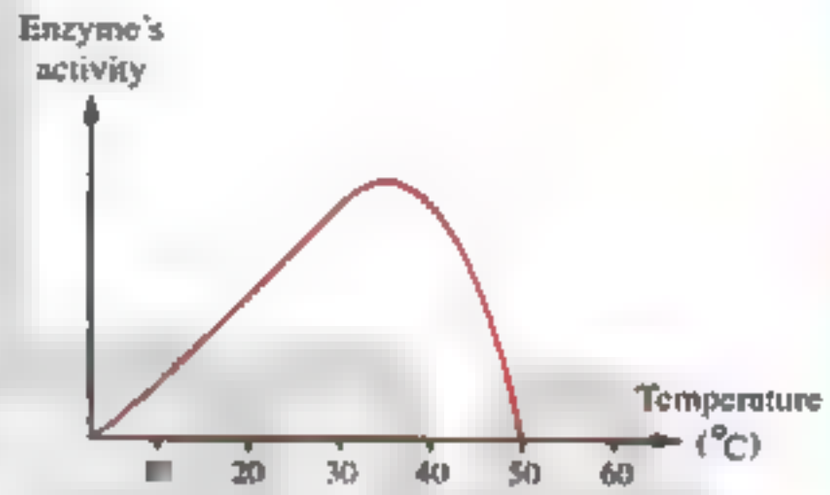
12 "Metabolic processes occur in the cells of the digestive system only".
How far this statement is correct ? With explanation.

13 **Give reason for :** the action of pepsin enzyme stops when arriving to the small intestine.

UNIT 1

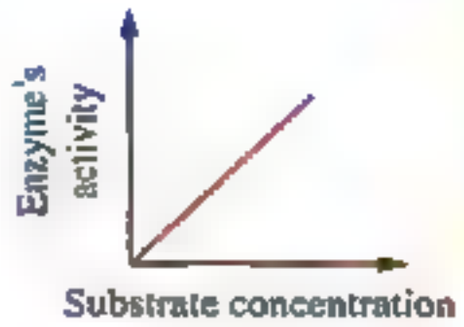
14 In the light of your study for the metabolism, **what happens when** eating a meal that is rich in carbohydrates after several hours ?

15 In an experiment to study the effect of temperature on the activity of an enzyme, a student added the enzyme on the substrate and provided the suitable conditions for the enzyme's action, then he represented the results as shown in the opposite graph. **What happen if** the student decreases the temperature ?



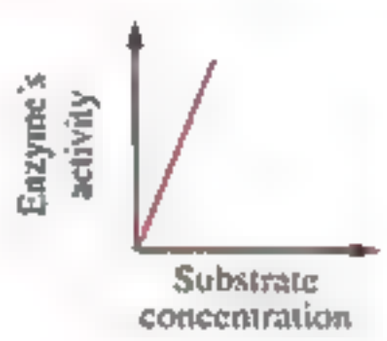
16 Lactic acid bacteria perform anaerobic respiration process, resulting in the production of lactic acid, and this process occurs by specialized enzymes produced by these bacteria, so that they are used in yogurt industry. **In the light of your study, what are the factors that affect the fermentation process and the conversion of the milk into yogurt within a short time ?**

17 **The opposite graph represents the activity of an enzyme that is extracted from cells of a mammalian animal at temperature 36°C. Study it, then answer :**

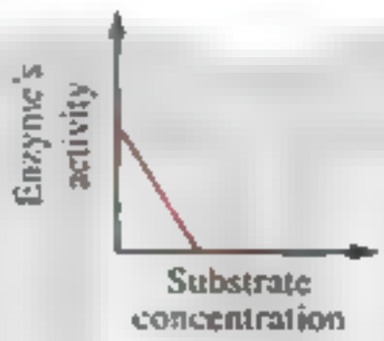


Which of the following graphs represents the enzyme's activity at temperature 18°C ? .....

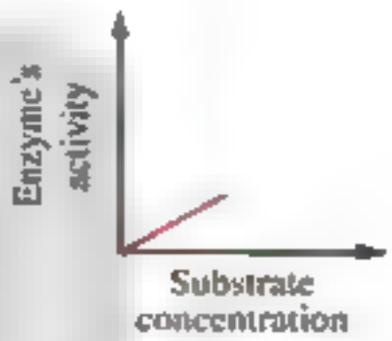
Explain your answer.



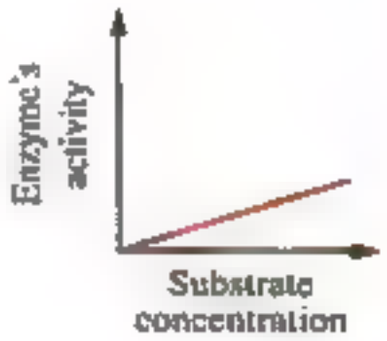
(a)



(b)



(c)



(d)

ACCUMULATIVE EXAM ON

UNIT 1

Chemical Basis of Life

Choose the correct answer (1 : 10) :

1. Which of the following doesn't belong to the biological macro-molecules ? .....
   - (a) Nucleic acid.
   - (b) Carbohydrate.
   - (c) Water.
   - (d) Protein.

2. The sugar that is known as a milk sugar is .....
   - (d) maltose.
   - (b) sucrose.
   - (c) galactose.
   - (d) lactose.

3. Nutrients are made up of smaller basic units and can be identified by food tests, which nutrient is a lipid ? .....

Nutrient	Smaller basic units	Food test
(d)	Amino acids	Benedict's test
(b)	Amino acids	Biuret's test
(c)	Fatty acids	Sudan-4 stain
(d)	Sugars	Biuret's test

4. The number of fatty acids that enter in the structure of one molecule of phospholipids is .....
   - (a) 2
   - (b) 3
   - (c) 4
   - (d) 5

5. Molecules with functional groups COOH and NH_2 can form polymers by a dehydration reaction through the formation of ..... bond.
   - (a) hydrogen
   - (b) covalent
   - (c) peptide
   - (d) ionic

Accumulative Exam

6 If a person suffers from pallor in face and increasing in the rate of heartbeats and the doctor asked him to perform a blood test. It is found that there is a deficiency in substance (X) and the doctor diagnosed that he suffers from anemia. What is the type of a medication that the doctor will give to him ? .....

ⓐ A medication containing sodium element.
ⓑ A medication containing zinc element.
ⓒ A medication containing iron element.
ⓓ A medication containing potassium element.

7 The cat differs from the lion, as the cells of each one of them .....

ⓐ contain different inorganic molecules.
ⓑ contain different large-sized organic molecules.
ⓒ manufacture different fats.
ⓓ contain different sequences of nucleotides in DNA

8 A human cell contains a length of DNA that carries the code for making .....

ⓐ fat substance. ⓑ glycogen substance.
ⓒ lipase enzyme. ⓓ starch.

9 Some plants digest insects and use the nutrients for growth, what must these plants produce to digest the insects ? .....

ⓐ Acids. ⓑ Alkalis. ⓒ Enzymes. ⓓ Hormones.

10 The following table shows whether starch was still present after four different experiments :

Experiment	Check
Starch + Water at 20°C	✓
Starch + Amylase at 20°C	✗
Starch + Amylase at 30°C	✗
Starch + Boiled amylase at 30°C	✓

Keys :
✓ = starch present.
✗ = starch absent.

What is it caused breaking down the starch ? .....

ⓐ Amylase. ⓑ Boiled amylase. ⓒ Heat. ⓓ Water.

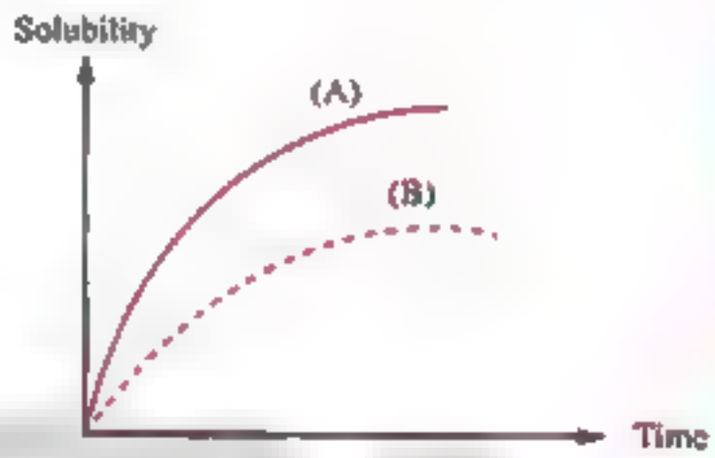
UNIT 1

Answer the following questions (11 : 17) :

11 **Explain :** monosaccharides are responsible for energy production processes inside the cells of the living organisms.

12 **From the opposite graph :**
Which line represents each of the following :
- Polysaccharides.
- Simple sugars.

Explain your answer.



13 **What happens in case of :** adding Sudan-4 stain to peanut seeds solutions ?

14 **Choose the anomalous word, then mention what links the rest :**
Albumin / Casein / Thyroxine / Haemoglobin.

15 **What is the difference between :** nitrogenous bases of DNA and RNA ?

Accumulative Exam

16 **If you have the following enzymes :**

(a) Enzyme (1) : catalyzes the hydrolysis of substance (X) into two glucose molecules.

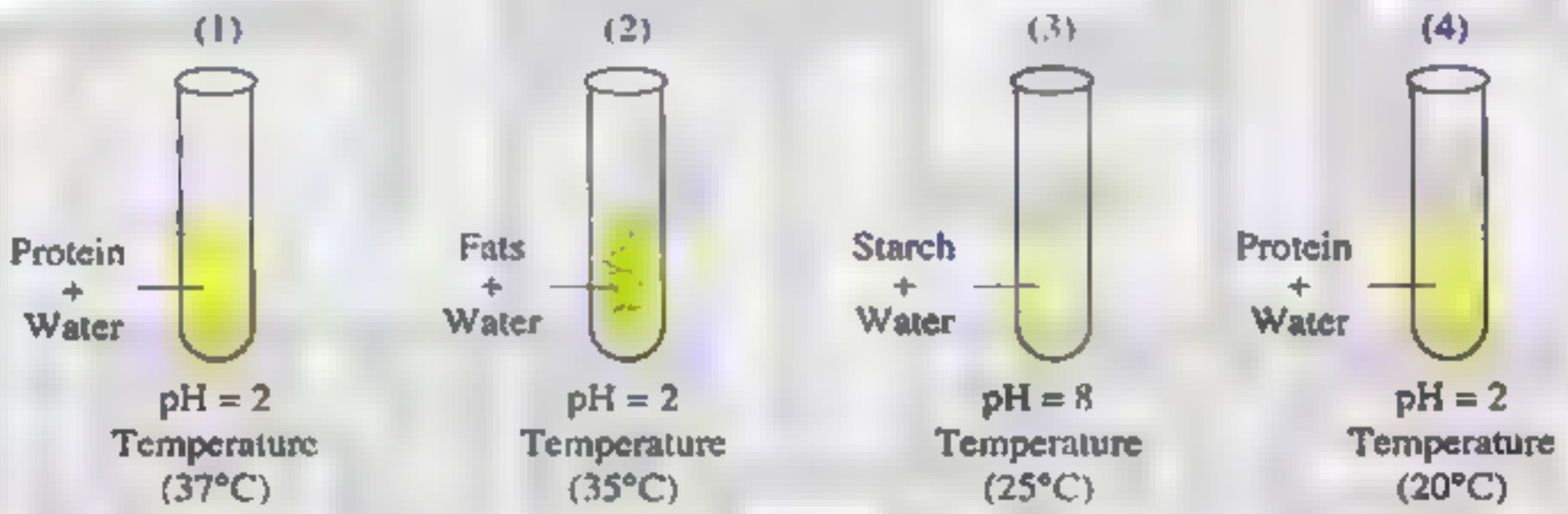
(b) Enzyme (2) : catalyzes the hydrolysis of substance (Y) into glucose and fructose.

(c) Enzyme (3) : catalyzes the hydrolysis of substance (Z) into glucose and galactose.

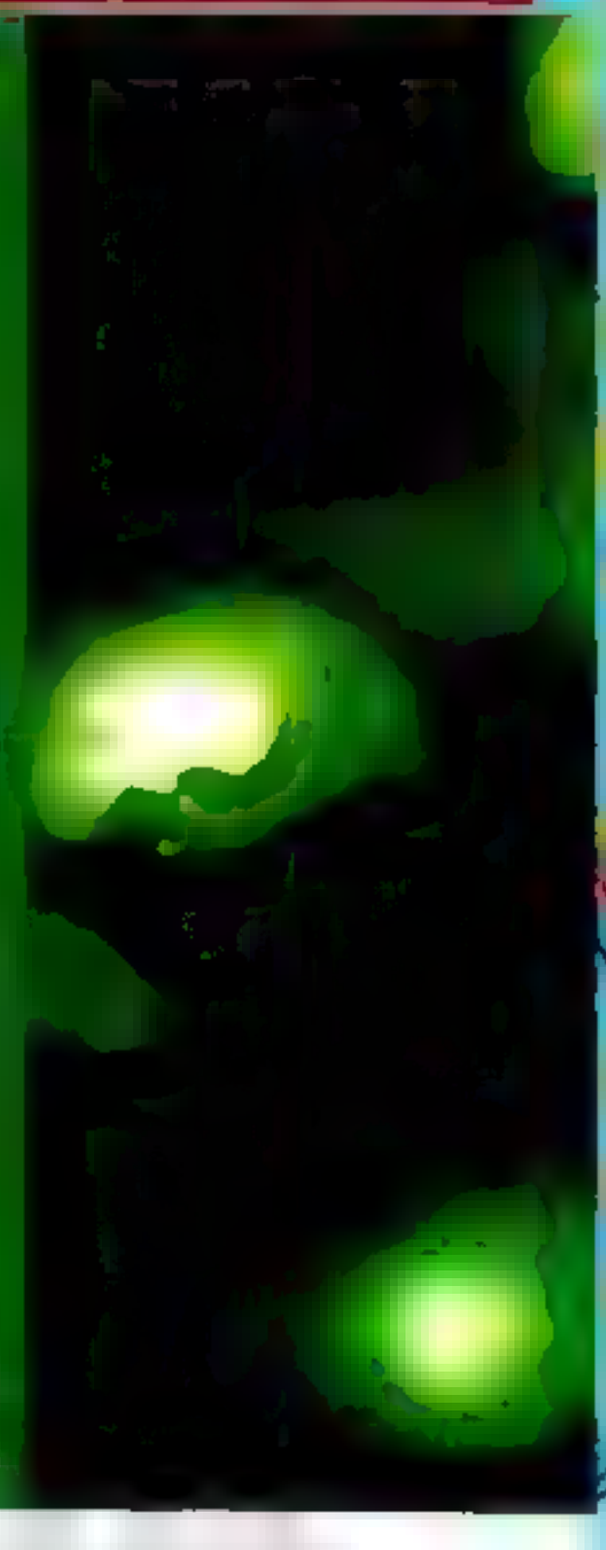
Use the given information and complete the spaces, then mention the names of substances (X , Y and Z) :

1. ..... $\xrightarrow{\text{Enzyme (.....)}}$ Fructose + ...
2. ..... $\xrightarrow{\text{Enzyme (.....)}}$ Galactose + ...
3. ..... $\xrightarrow{\text{Enzyme (.....)}}$ Glucose + Glucose.

17 **Which** of the following digestion processes works better after adding pepsin enzyme to each one of them ? **And why ?**



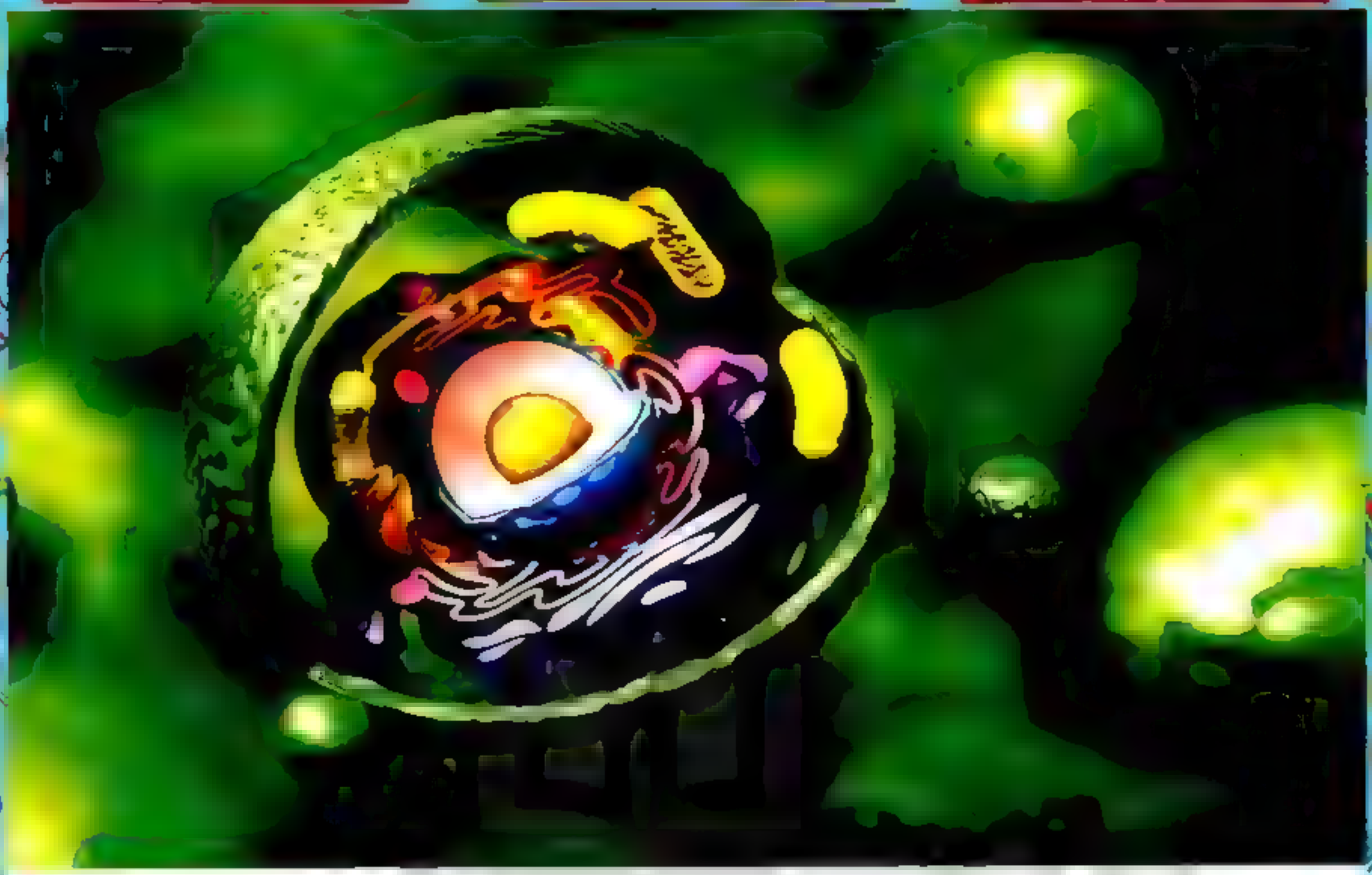
Why don't the other digestion processes occur ?



UNIT

2

Cell : Structure and Function



Objectives of the unit

By the end of this unit, the student should be able to :

- Explain how the developing of the microscope contributed to state the cell theory.
- Appreciate the efforts of scientists in discovering the cell and their components.
- Explain the principles of the cell theory.
- Compare between the animal and plant cells.
- Draw the accurate structure of the animal and plant cells.
- Examine the animal and plant cells microscopically.
- Identify the organelles of the plant and animal cells and the functions of each one of them.
- Explain the ultrastructure of the cell nucleus and its functions.
- Describe the structure of chromosomes.
- Identify the number of chromosomes in some species of living organisms.
- Explain the structure of the cell wall and its function.
- Explain the ultrastructure of plasma membrane.
- Explain the role of plasma membrane in the process of cellular transport.
- Compare between the prokaryotic and eukaryotic cells.
- Clarify the differentiation of cells into specialized tissues, organs and systems in multicellular animal and plant living organisms.
- Appreciate the grandeur of Allah in the ultrastructure of the cell as a building unit of all living organisms.
- Discard the extremism, fundamentalism and give up clinging the opinion.
- Follow up the scientific methods to solve the problems.

CHAPTER 1

Cell Theory

- **All living organisms are characterized by common characteristics, such as :** Nutrition, transporting, respiration, excretion, motion, sensation and reproduction.

★ **Living organisms are divided into :**

Unicellular organisms

- Their body consists of one cell only which performs all the vital activities needed for the continuity of life.
- They represent some living organisms.

Examples

Amoeba, bacteria and *Paramecium*.

Bacteria (Unicellular)

Multicellular organisms

- Their body consists of many cells which differentiate and specialize in their functions.
- They represent most of the living organisms.

Human, whale and trees.

Whale (Multicellular)

Chapter 1

Diversity of cells

Cell

It is the tiniest building unit in the organism's body that is capable of carrying out all the functions of life

- Some examples of cells :

A group of various cells magnified 700 times of their real sizes

- From the previous figures, we can conclude that :

1. **Cells are varied in shape, structure and size, where :**
   - The tiniest cell in size is the bacterial cell.
   - The biggest cell in size is the cell of unfertilized egg (ostrich egg).
2. **There is a relationship between the shape of cells and functions that they perform, such as :**
   - Nerve cells (Neurons) : are the **longest** cells (may reach a meter or little more) to be able to transfer the messages from the spinal cord that is present inside the vertebral column to the farthest parts of the body, such as toes.
   - Muscular cells : are characterized by being **cylindrical** and **long**, and **gather with each other** to form the muscle fibers which can contract and relax, helping the animal to move freely.

Test yourself

Choose the correct answer :

Which of the previous cells play a role in the movement of human body ? .....

ⓐ (X) and (Y). ⓑ (X) and (L). ⓒ (Y) and (Z). ⓓ (Y) and (L).

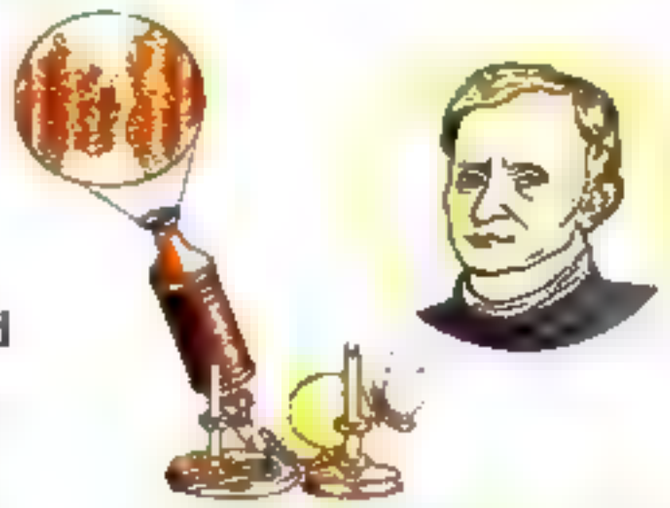
UNIT 2

Cell discovery

- **The role of the scientists in discovering the cell and its structure :**

The English scientist : Robert Hooke

- The favour of cell discovery is referred to Robert Hooke who invented a simple microscope in 1665 and used it to examine a piece of cork tissue. He found that it is composed of small boxes arranged in rows and he named each box by the word "cell", the term "cell" is derived from the Latin word "Cellula" which means the cell or small room.


Robert Hooke microscope

The Dutch scientist : Antonie Van Leeuwenhoek

- He made a simple microscope by using lenses in 1674 with the ability to magnify objects up to 200 times of their real sizes. He used it for examining different substances, such as water of ponds, blood and others. So, Van Leeuwenhoek was the first who observed the world of the microscopic organisms and living cells.


Van Leeuwenhoek microscope

The German scientist : Matthias Schleiden

- In 1838, he deduced that all the plants are composed of cells. He stated his deduction depending on his own researches and those of other previous scientists.

The German scientist : Theodor Schwann

- In 1839, he deduced that the bodies of all living organisms are composed of cells.

The German doctor : Rudolf Virchow

- In 1855, he stated that the cell is the functional and building unit of all the living organisms.
- He emphasized that the new cells are originated only from other pre-existing living cells.

- **The efforts of the previous scientists have resulted and given rise to what is known now as the "cell theory".**

Cell theory

- Cell theory is considered one of the most important basic theories in the modern biology.
- This theory is mainly based upon three principles, **which are :**
  1. All the living organisms are made up of cells which may be single or grouped in clusters.
  2. Cells are the basic functional units of all the living organisms.
  3. All cells come only from other pre-existing living cells.

Test yourself

Choose the correct answer :

(1) From the principles of the biology evolution of the living organisms that each type of the living organisms is originated from other pre-existing living organism's type and simpler in its structure, who is the scientist followed the same principle in the cell discovery ? .....

ⓐ Theodor Schwann. ⓑ Virchow.

ⓒ Van Leeuwenhoek. ⓓ Schleiden.

(2) From the principles of the cell theory is .....

ⓐ all the living cells have nuclei.

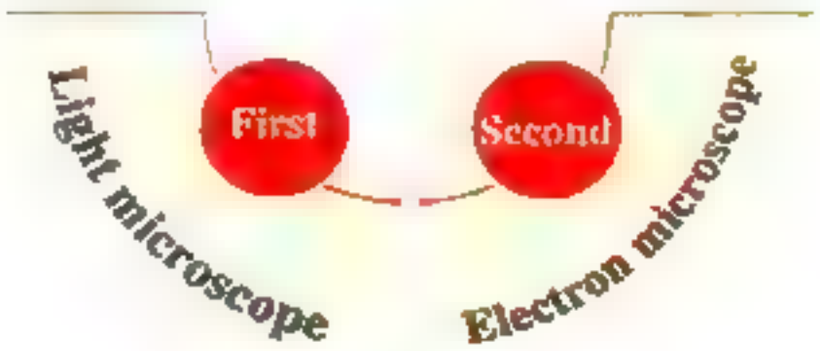
ⓑ all the living cells contain organelles.

ⓒ the cell is the structural unit of the living organism.

ⓓ the cell contains water.

Development of microscopes

- It is difficult to visualize the cell or its components, due to its very minute size. So, the cell discovery was related to the invention of microscope. Also, the vision of the cell's components was related to the increase of the magnifying power of the microscope. The studies of the cell structure were crowned with the invention of the electron microscope which has a high magnifying power. **So, there are two types of microscopes :**



UNIT 2

First Light microscope

- Until 1950, the light microscope was the only device that is available for the scientists to examine the living structures and non-living things.

Idea of its work

It depends on the sunlight or the artificial light.

Type of used lenses

Glass lenses (ocular and objective lenses).

Functions

1. Magnifying many micro-organisms and non-living things.
2. Examining large-sized objects after cutting them into very thin slices to allow the light to permeate through them.

For illustration only

- ***The light microscope contains different objective lenses that differ in their magnifying power, and the more common ones are :***
  - *Scanning objective lens (4x).*
  - *Low power objective lens (10x).*
  - *High power objective lens (40x).*
  - *Oil immersion lens (100x).*

Magnifying power

- It magnifies objects up to 1500 times of their real sizes and it can't magnify objects more than 1500 times, **because** the image becomes unclear (blurred).
- Its magnification power depends on the magnifying power of its ocular and objective lenses.
- **The magnifying power of the microscope can be determined by the following relation :**

Magnifying power of the microscope =
Magnifying power of the ocular lens × Magnifying power of the objective lens

- **Example :**

If you know that the magnifying power of the objective lens equals (50x) and the magnifying power of the ocular lens equals (10x). **Calculate the magnifying power of this microscope.**

- **Solution :**

Magnifying power of the microscope = Magnifying power of the objective lens ×
Magnifying power of the ocular lens = 50 × 10 = 500 times.

Methods of obtaining the most clear image of specimens under the lenses of the light microscope :

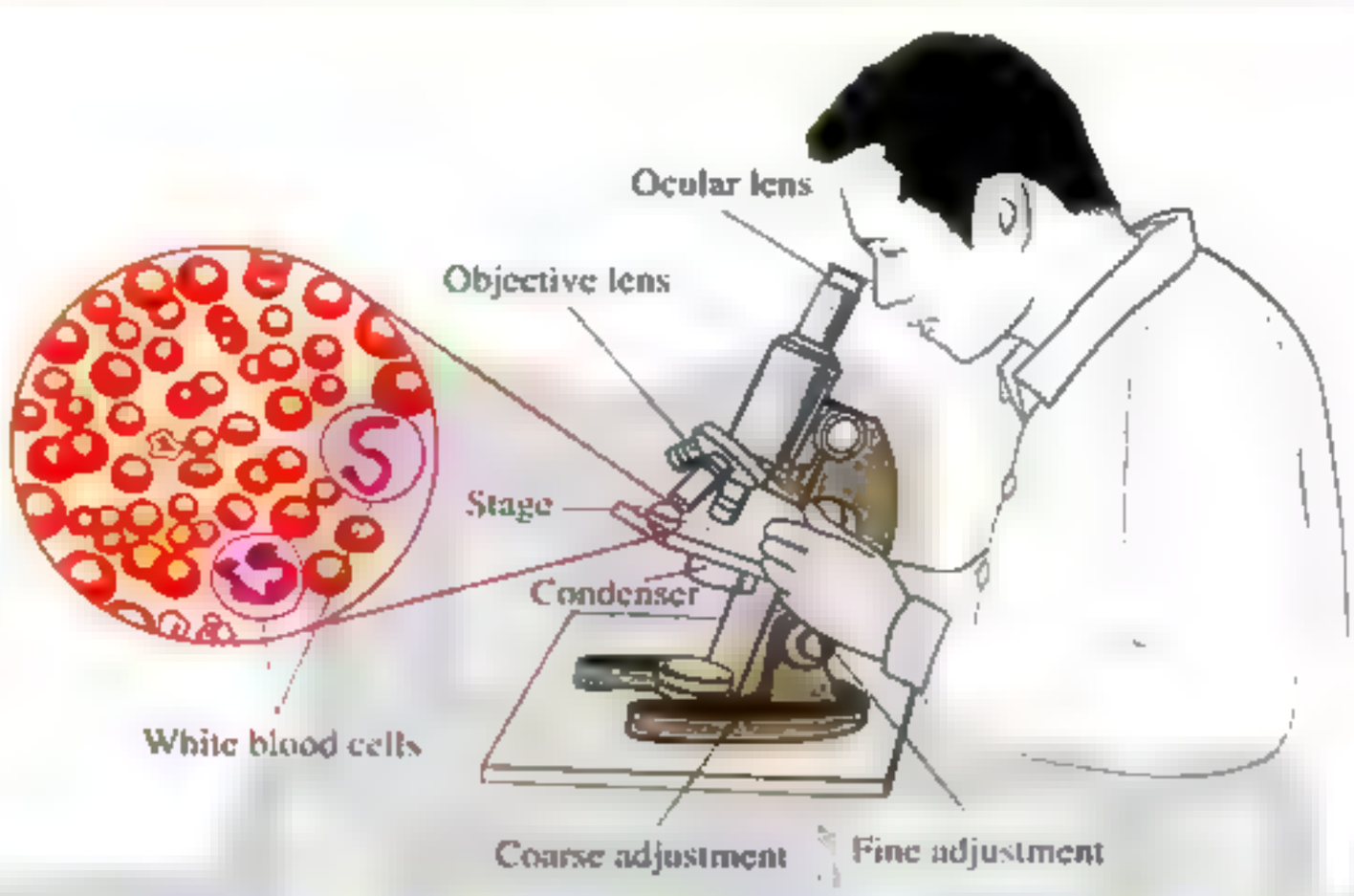
- Scientists found that the best method to examine specimens more clearly is the increase of the contrast between different parts of the specimen by :

1. Changing the level of lighting (light intensity).

2 Using dyes :

- These dyes are used to stain or colour a certain parts of the specimen to be more clear.

Example : the dye that is added on examining the white blood cells.



White blood cells are seen by a compound light microscope and the image is magnified 1000 times of its real size

Note

From the disadvantages of the dyes that they kill the living specimens. So, it is not preferred to add dyes on examining the specimens of unicellular (prokaryotic) organisms, such as *Amoeba*, *Paramecium* and also yeast fungus.

3 Test yourself

Choose the correct answer :

(1) If the magnifying power of the ocular lens is (20x) and that of the objective lens is (100x), the image that is formed by this microscope is .....

ⓐ clear. ⓑ accurate. ⓒ unclear. ⓓ not seen.

(2) To examine the types of white blood cells by the light microscope, it is preferred that its magnifying power is .....

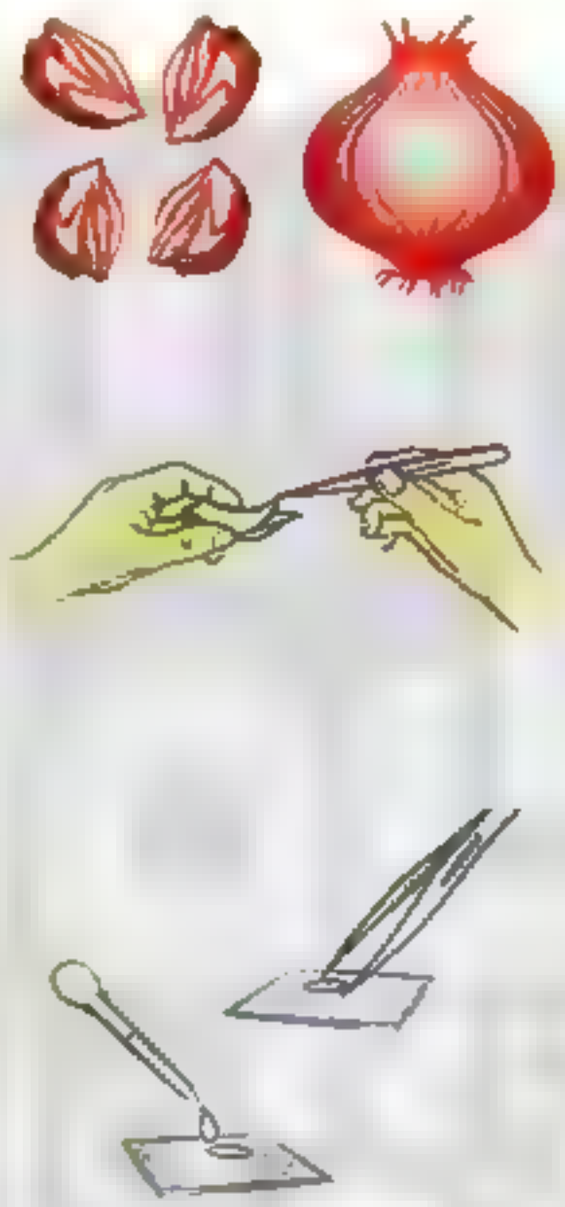
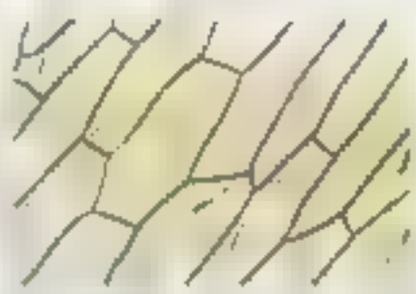
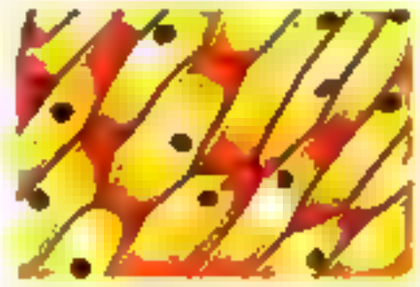
ⓐ 10 × 10 ⓑ 10 ≡ 40 ⓒ 10 × 100 ⓓ 40 × 40

UNIT 2

Practical Activity 6 Ideal using of the compound light microscope

1. Used materials and tools :

- Onion. - Glass slide. - Coverslip. - Forceps. - Compound light microscope.
- Scalpel. - Dropper. - Blotter. - Iodine solution.

Procedures	Figures	Observations
1 Cut the onion into 4 pieces and use the forceps to separate the thin membrane lining the concave surface of one of the pieces. Put this part on a glass slide and add a water drop on it, then cover it with a coverslip. 2 Examine the specimen by using the low power objective lens. then with the high power objective lens and notice the superficial layer of cells.		• When examining by the low power objective lens, we see many small-sized hexagonal cells that are arranged in rows adjacent to each other.  • When examining by the high power objective lens, we see that the number of cells will decrease and we will see them bigger. 
3 Remove the excess water by using the blotter, then add a drop of iodine at an edge of coverslip. 4 Re-examine the specimen by using the low power objective lens, then the high power lens and observe the difference.	 	• When examining by the high power objective lens after adding the iodine solution, we see the cells more clear, due to the staining of the cell's components with orange colour of iodine. i.e. By adding a stain to the specimen, it becomes more obvious. 

2. Conclusion :

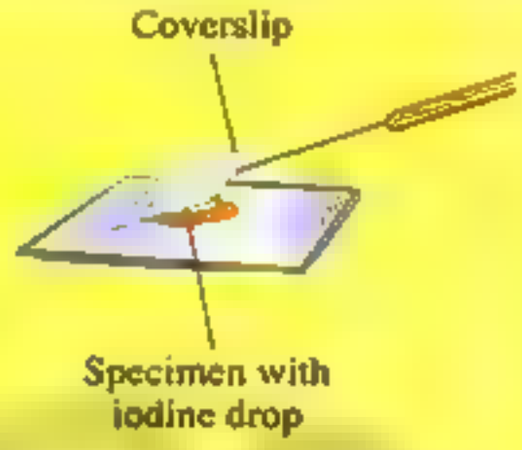
1 The compound light microscope is used to magnify and examine the tiny things and their components.

2 The compound light microscope is used in a correct form when putting a specimen on the slide, then putting it on the stage and using the condenser to control the intensity of light directed to the slide. then the fine adjustment and coarse adjustment are moved to adjust the ocular and objective lenses for obtaining the clear image.

Test yourself

Choose the correct answer :

(1) The opposite figure illustrates a method to examine a specimen of a plant tissue by the light microscope after adding a drop of iodine on this specimen, and then it is covered by a coverslip with a certain angle as shown in figure to .....



ⓐ see the specimen with its original size.
ⓑ reduce the presence of air bubbles.
ⓒ reduce the size of this specimen.
ⓓ be more clear and transparent.

(2) The relation between the number of cells that are appeared by the light microscope and the magnifying power of the used lenses is .....

ⓐ inverse relation.
ⓑ direct relation.
ⓒ equal relation.
ⓓ not related.

Second Electron microscope

• Since 1950, the scientists started to use the electron microscope.

Idea of its work

It depends on using a beam of high speed electrons instead of light.

Type of used lenses

Electromagnetic lenses that control the electrons beam.

Functions

1 Clarifying the cellular components that had not been known before.

2 Knowing more accurate details about the cellular structures that had been known before.

Electron microscope

UNIT 2

Magnifying power

It magnifies objects one million time or more of their real sizes.

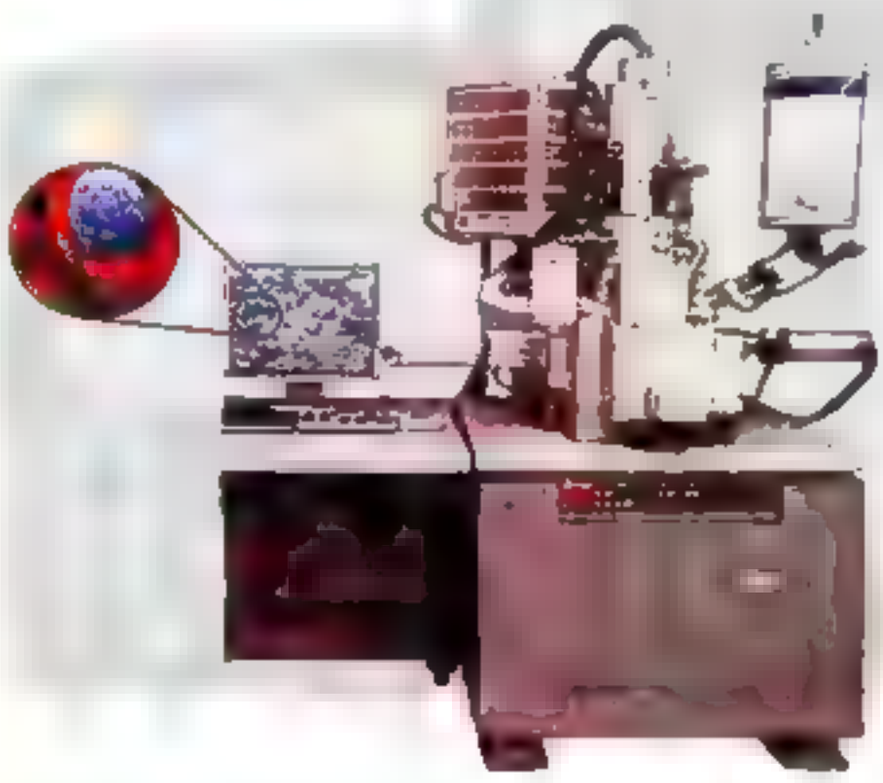
Properties of its images (micrographs)

They are highly magnified and highly contrasted comparatively with those produced by the light microscope, due to the shortness of wavelength of the electronic ray comparatively with that of the light ray and they are received on a fluorescent screen or on a highly sensitive photographing board.

Types

1 Scanning electron microscope

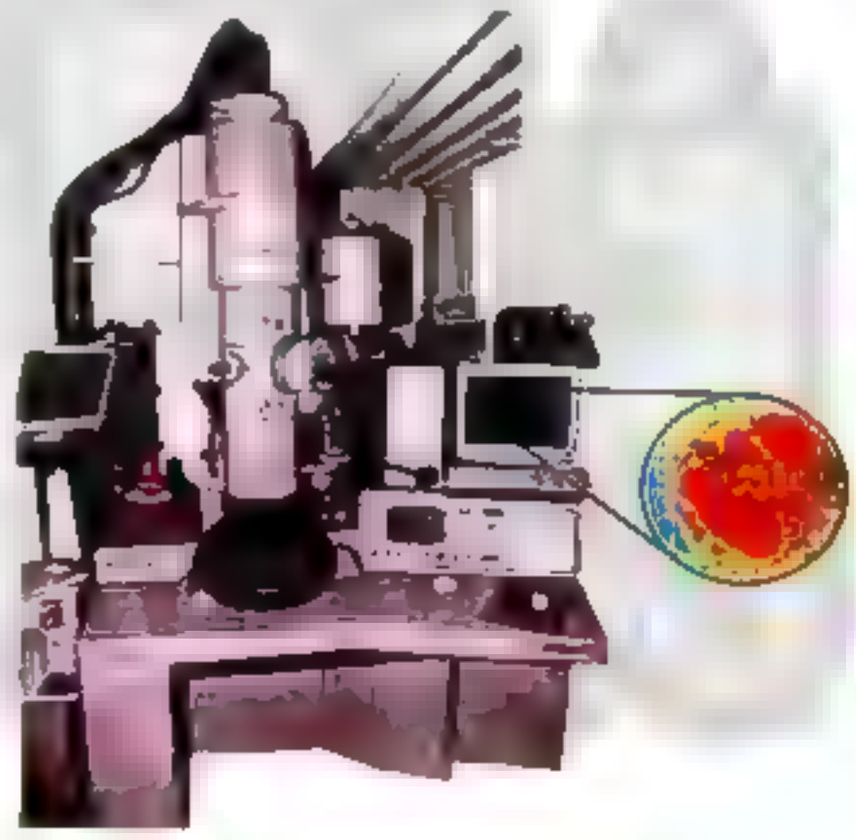
- It is used to study the cell surface.



A micrograph of a white blood cell by using the scanning electron microscope (Magnifying power is 3500x).

2 Transmission electron microscope

- It is used to study the cell internal structures.



A micrograph of a white blood cell by using the transmission electron microscope (Magnifying power is 8900x).

From the previous figures, it is noticed that the micrograph of the white blood cell is more clear by using the transmission electron microscope, due to the easiness of distinguishing of its internal components.

☆ Comparison between the light microscope and the electron microscope :

P.O.C.	Light microscope	Electron microscope
Idea of work :	Depends on the sunlight or the artificial light.	Depends on a beam of high speed electrons.
Type of used lenses :	Glass lenses.	Electromagnetic lenses.
Magnifying power :	Low (maximum magnification doesn't exceed 1500 times of the object's real size).	Very high (may reach one million time or more of the object's real size).
The wavelength of the used ray :	Longer than that used in the electron microscope.	Shorter than that used in the light microscope.
Observation of the specimen :	Through the ocular lens.	Through a fluorescent screen or on a highly sensitive photographing board.
Power of contrast :	Low	Very high.
Functions :	(1) Magnifying many micro-organisms and non-living things. (2) Examining large-sized objects after cutting them into very thin slices that allow the light to permeate through them.	(1) Clarifying the cellular components that had not been known before. (2) Knowing more accurate details about the structures that had been known before.

Test yourself

Choose the correct answer :

(1) To study the shapes of the nuclei of white blood cells, the biologists use .....

ⓐ light microscope. ⓑ scanning electron microscope.

ⓒ transmission electron microscope.

ⓓ both of scanning and transmission electron microscopes.

(2) In medial analysis lab, the method to distinguish among the different types of the blood cells in a certain specimen is using the .....

ⓐ light microscope after adding dyes. ⓑ light microscope without adding dyes.

ⓒ scanning electron microscope. ⓓ transmission electron microscope.

QUESTIONS ON

CHAPTER 1

Cell Theory

Interactive test

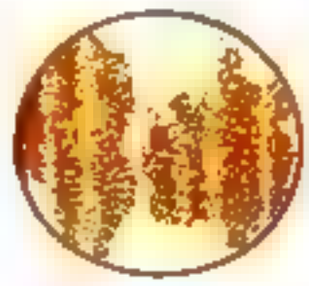
The questions signed by measure the high levels of thinking.

First Multiple Choice Questions

1 The cells of the stomach tissues are different in each of the following, except in the .....

(a) shape. (b) presence of nuclei. (c) function. (d) size.

2 The opposite figure illustrates a cork tissue, in the light of this, answer :

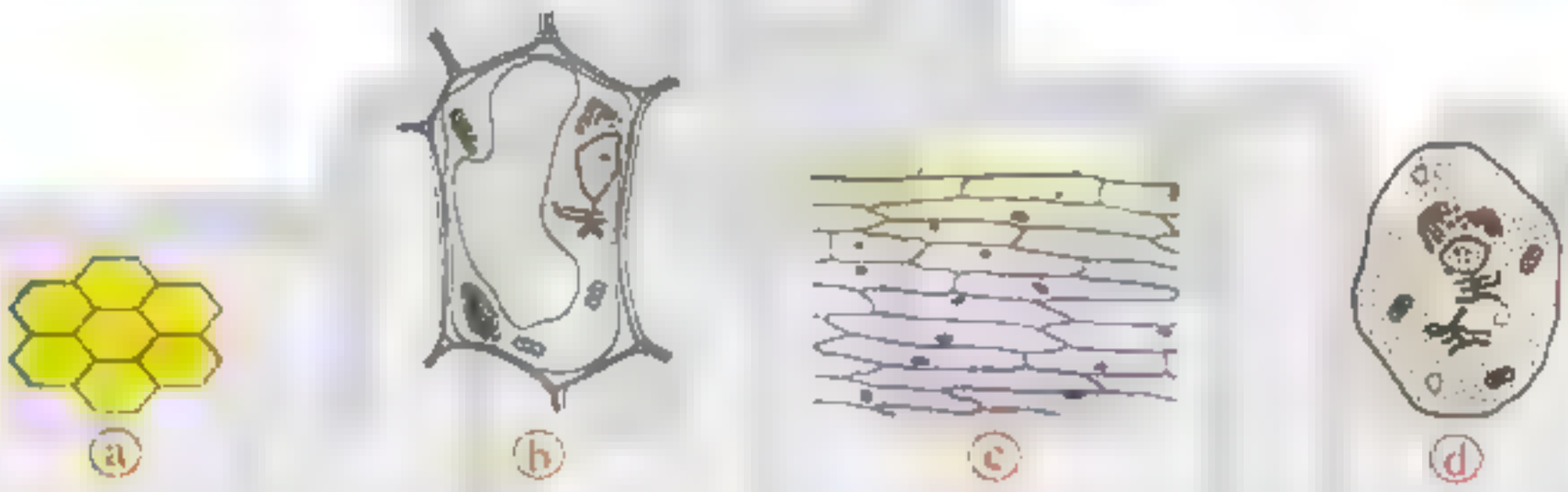


(1) The scientist who could see this figure for the first time is .....

(a) Virchow. (b) Schwann.

(c) Robert Hooke. (d) Schleiden.

(2) On examining this figure by using Leeuwenhoek microscope, which of the following figures would be appeared ? .....



(a) (b) (c) (d)

(3) This figure was seen through the .....

(a) compound light microscope. (b) simple microscope.

(c) scanning electron microscope. (d) transmission electron microscope.

3 The scientist who could see *Paramecium* for the first time by using lenses with magnifying power may reach up to 180 times of its real size is .....

(a) Virchow. (b) Robert Hooke. (c) Van Leeuwenhoek. (d) Schwann.

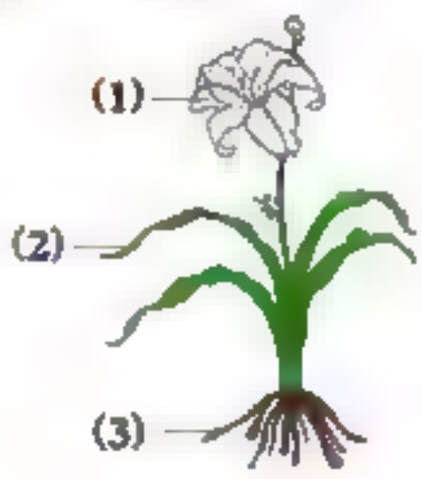
4 In front of you, this figure represents a prokaryotic organism "*Amoeba*", which of the following microscopes was used to observe this organism for the first time ? .....

(a) (b) (c) (d)

5 From the origin of life theories is the spontaneous generation theory that held the living organisms could arise suddenly and spontaneously from any non-living matter, through your study of the cell theory, this is not agreed with the principle that is stated by the scientist .....

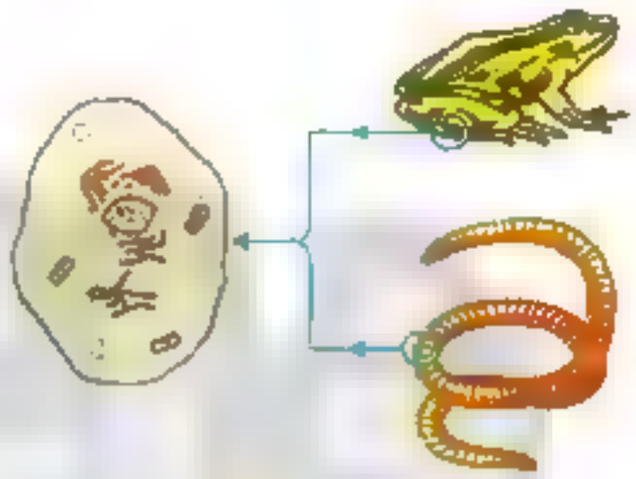
(a) Schwann. (b) Schleiden. (c) Virchow. (d) Robert Hooke.

6 The first scientist who proved that each of (1), (2) and (3) in the opposite figure has the same building unit is .....



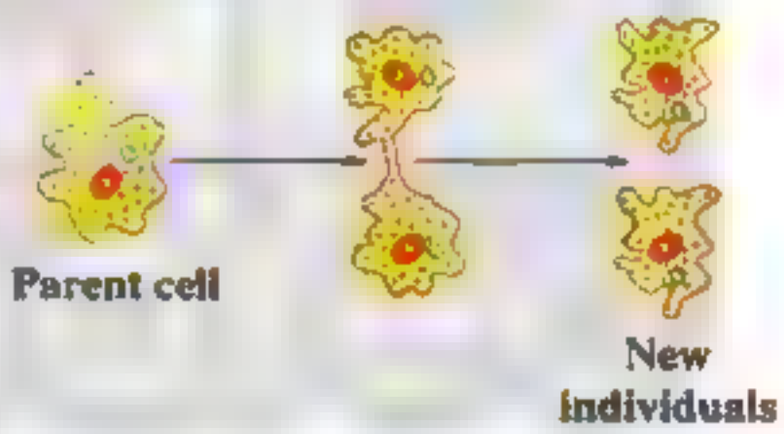
(a) Schwann. (b) Virchow.
(c) Schleiden. (d) Van Leeuwenhoek.

7 The opposite figures illustrate one of the principles of the cell theory, who is the scientist stated this principle ? .....



(a) Virchow.
(b) Van Leeuwenhoek.
(c) Schwann.
(d) Robert Hooke.

8 The opposite figure illustrates the mitotic division of *Amoeba* to give new individuals similar to the parent cell. Who is the scientist confirmed this principle ? .....



(a) Schwann. (b) Leeuwenhoek.
(c) Robert Hooke. (d) Virchow.

9 Which of the following is not from the principles of the cell theory ? .....

(a) All the living organisms are made up of a cell or more.
(b) New cells can replace the damaged cells.
(c) Prokaryotic organisms are originated from the complex organisms.
(d) The organ does its function, if the cells perform their action.

10 Which one of the following supports the cell theory ? .....

(a) All the living cells need to glucose.
(b) The living cell contains a nucleus to regulate its vital functions.
(c) All the living cells contain cell wall.
(d) The cell is a basic unit for the life.

UNIT 2

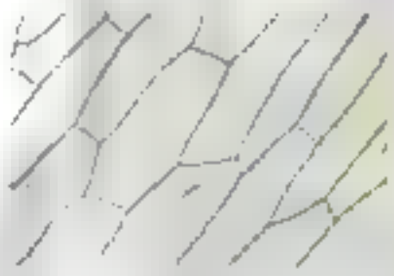
11 Which of the following statements doesn't obey the cell theory ? .....

ⓐ The division of the cell of *Amoeba* during asexual reproduction.
ⓑ The division of the cell of yeast fungus during asexual reproduction.
ⓒ The division of mitochondria during the cellular division.
ⓓ The division of a bacterial cell during asexual reproduction.

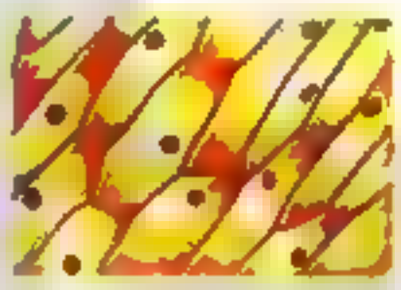
12 To use the light microscope for obtaining a clear image, the magnifying power can be .....

ⓐ 40 × 50 ⓑ 10 × 100 ⓒ 40 × 40 ⓓ 30 × 60

13 A student examined some plant cells by using the light microscope. At the beginning, he obtained figure no. (1), then he carried out a certain examination and obtained figure no. (2) as shown in the following figures. What did the student carry out to obtain the figure no. (2) ? .....



(1)



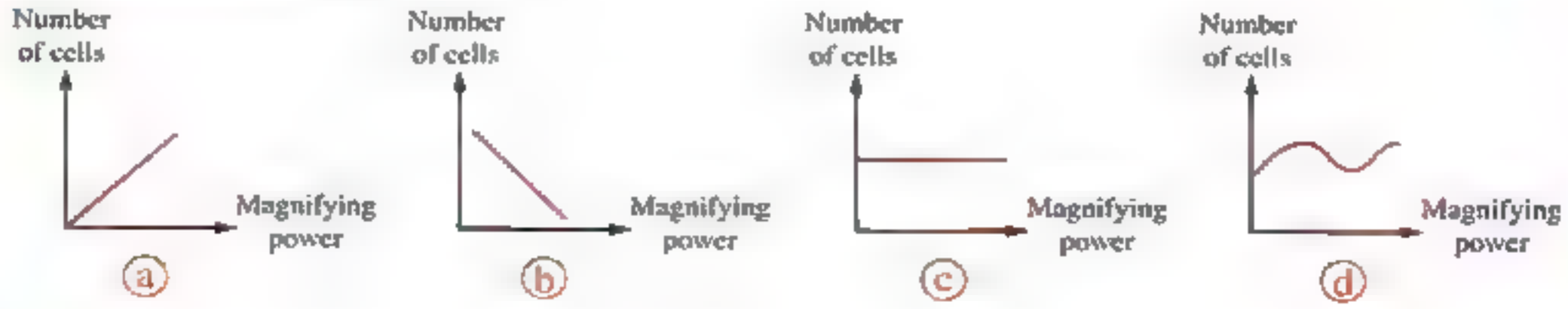
(2)

ⓐ He added a dye to the specimen.
ⓑ He added a distilled water on the specimen.
ⓒ He added ethyl alcohol on the specimen.
ⓓ He used a lens with a higher magnifying power than that of used in the first examination.

14 The different white blood cells can be distinguished by using the compound microscope through each of the following, except .....

ⓐ using dyes.
ⓑ changing the power of light.
ⓒ using the magnifying power of the microscope = 1000x.
ⓓ using the magnifying power of the microscope = 2500x.

15 Which graph illustrates the relation between the number of cells that appear when examining an onion plant tissue and the magnifying power of the lenses that are used in the light microscope ? .....



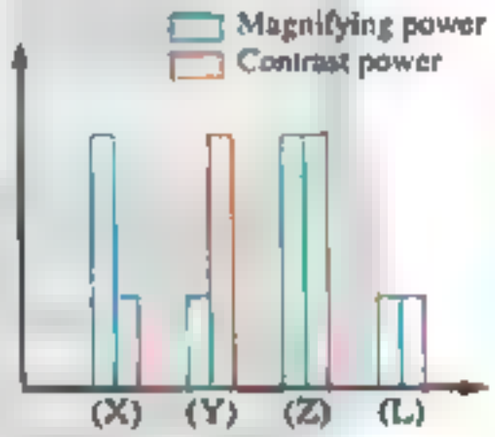
16 The compound microscope is used in .....
(a) seeing the specimen with its real size.
(b) seeing the specimen smaller in size.
(c) seeing the specimen larger than its size.
(d) seeing the contents of the nucleus.

17 When examining a slice of onion under the microscope, the magnifying power of the used microscope to be able to see the genetic material reaches about..... time(s).
(a) 100
(b) 1500
(c) 7000
(d) one million

18 Which of the following can be seen by the light microscope ? .....
(a) Bacterial cell.
(b) Virus.
(c) Nuclear pores in a plant cell.
(d) The internal structure of the mitochondria in an animal cell.

19 The magnifying power of the electron microscope reaches one million time, while that of the light microscope reaches 1500 times, this is because .....
(a) the speed of light is more than that of electrons.
(b) the wavelength of the light beam is shorter than that of the electrons beam.
(c) the wavelength of the electrons beam is shorter than that of the light beam.
(d) the visible light consists of seven spectrum colours, where each one of them has a different wavelength.

20 In the opposite graph, which of the following illustrates the characteristics of the image of the nucleic acid (DNA) when examining it under the electron microscope ? .....
(a) (X).
(b) (Y).
(c) (Z).
(d) (L).



21 The best method to see the condensed chromosomes in the chromatin network is using the .....
(a) light microscope.
(b) scanning electron microscope.
(c) transmission electron microscope.
(d) scanning and transmission electron microscopes.

22 When studying the external details of a white blood cell, it is used .....
(a) the light microscope with magnifying power reaches 2000x.
(b) the light microscope with magnifying power reaches 2500x.
(c) the scanning electron microscope with magnifying power reaches 3500x.
(d) the transmission electron microscope with magnifying power reaches 8900x.

UNIT 2

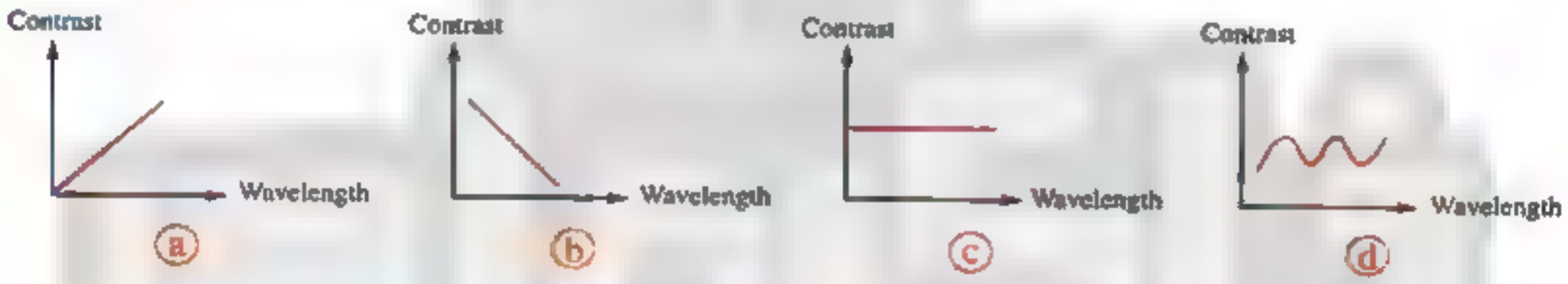
23 In the biochemical researches, new basics appeared to determine the degree of the relevance and relationship among organisms through the determination of the arrangement and sequence of nucleotides in the nucleic acid (DNA), depending on that the scientists use the .....

(a) light microscope.
(b) simple microscope.
(c) transmission electron microscope.
(d) scanning electron microscope.

24 The light microscope is characterized than the electron microscope by giving .....

(a) a higher magnifying power than that of the electron microscope.
(b) an image with more accurate details.
(c) a chance to see the tissues.
(d) an image equal in size to the image of specimen.

25 Which of the following graphs represents the relationship between the contrast and the wavelength of the used beams in the microscopes ? .....



Second Miscellaneous Questions

1 The two opposite figures illustrate two different types of the visual devices : **Identify** each one, then **show** the difference between them.

Figure (1)

Figure (2)

2 "The nerve cell has the ability to transmit the nerve impulses from the skin to the muscles directly". **How far this statement is correct ? With explanation.**

3 **What is the difference between :** the building unit of the nervous system **and** the building unit of the muscular system ?

4 "The worms that are formed in meat when left it in the air for a period of time are produced from the meat itself".
How far this statement is correct ? With explanation.

5 "The living cells are arisen spontaneously from non-living matters".
How far this statement is correct ? With explanation.

6 **Give reason for :** it is not preferred to add dyes to *Amoeba* on its examination.

7 **What happens in case of :** the magnifying of the specimen of an animal tissue by using the light microscope more than 1500 times of its real size ?

8 In front of you, two figures no. (1) and no. (2) of a sample of the same living organism under the light microscope, **illustrate** how figure no. (1) is changed into figure no. (2).

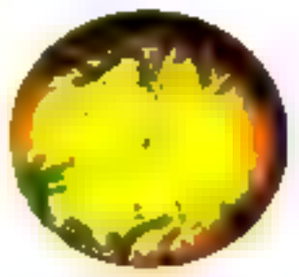
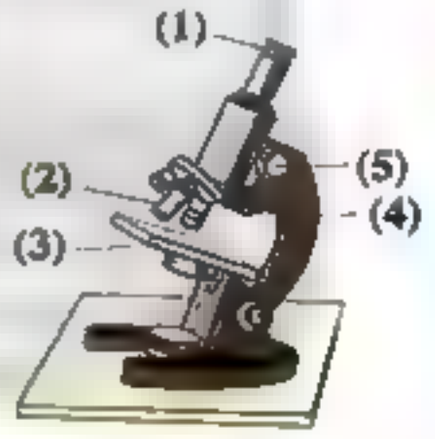


Figure (1)

Figure (2)

9 **In the school lab, the teacher of biology asked you to prepare two slides, one from pond water and the other for a smear from the lining membrane of the mouth.**
In the light of this, answer :
(a) Which one of the two slides will you prefer to prepare with adding dyes ? **Explain your answer.**
(b) What are the precautions to be observed in order to obtain a clear image for the specimens under study ?

10 **From the opposite figure :**
(a) Write the number and the name of the structures that are used to know the magnifying power of this microscope.
(b) Explain : on examining a plant leaf by using this figure, it should be cut into thin slices.



11 **What happens in case of :** using dyes to stain or colour the specimen that is wanted to be examined ?

12 If you know that the magnifying power of the objective lens is (40x) and that of the ocular lens is (10x). **What** is the magnifying power of this light microscope ?

13 On examining the opposite sample by the light microscope whose magnifying power of the ocular lens equals (10x). **Conclude** the magnifying power of the objective lens.

(The magnifying power of the microscope = 1000x)

UNIT 2

14 What happens if : the magnifying power of the objective lens in the light microscope equals (100x) and the magnifying power of the ocular lens equals (20x) ?

15 Give reason for : the electron microscope is better than the light microscope in the examination.

16 Compare between : the light microscope and the electron microscope, "in terms of : magnifying power – type of used lenses – contrast power – function – the wavelength of beam".

17 What are the differences and similarities between : the scanning electron microscope and the transmission electron microscope ?

18 The two opposite figures no. (1) and no. (2) represent two images of a nerve cell :
Determine which of them is photographed by a scanning electron microscope and which by a transmission electron microscope, **with explanation.**

Figure (1)

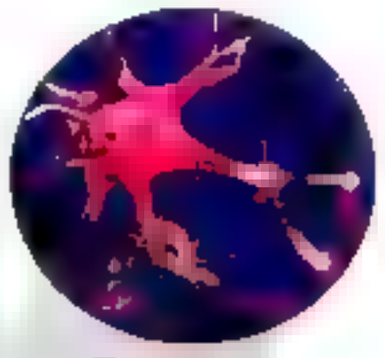


Figure (2)

19 The following table illustrates some characteristics of three different microscopes :

	Microscope (1)	Microscope (2)	Microscope (3)
Contrast	Low	High	High
Wavelength	Long	Short	Short
Magnifying power	1500	3500	9000

Write the number and the name of the microscope through which each of the following can be seen :

(a) The cell wall and its pores.

(b) The internal membrane of the mitochondria.

(c) A cell inside a human skin tissue.

Model Exam on

Chapter 1

Cell Theory

Choose the correct answer (1 : 10) :

1 The scientist who is the founder of the cell theory is .....

ⓐ Robert Hooke. ⓑ Theodor Schwann.

ⓒ Schleiden. ⓓ Virchow.

2 Light microscope with magnifying power (400x), if the magnifying power of its ocular lens is (10x), therefore the magnifying power of its objective lens is .....

ⓐ (30x). ⓑ (40x).

ⓒ (50x). ⓓ (60x).

3 The first scientist who proved that the cell is the functional unit is .....

ⓐ Robert Hooke. ⓑ Theodor Schwann.

ⓒ Schleiden. ⓓ Virchow.

4 Schleiden was the first scientist who observed that the cell is the building unit, because .....

ⓐ he was the first who observed the world of the microscopic organisms.

ⓑ he was the first who examined an animal tissue and he found it consisting of cells.

ⓒ he was the first who examined a plant tissue and he found it consisting of cells.

ⓓ he was the first who made a compound light microscope.

5 The scientist who Schwann depends on one of his principles in showing his conclusion, is .....

ⓐ Robert Hooke. ⓑ Van Leeuwenhoek.

ⓒ Schleiden. ⓓ Virchow.

6 The microscope that is used in studying the details of the internal surface of mitochondria in a muscular cell is .....

ⓐ simple light microscope. ⓑ compound light microscope.

ⓒ scanning electron microscope. ⓓ transmission electron microscope.

UNIT 2

7 In bio-lab, a student observed some phenomena on examining by using the compound microscope. Which one of these phenomena supports the cell theory ? .....

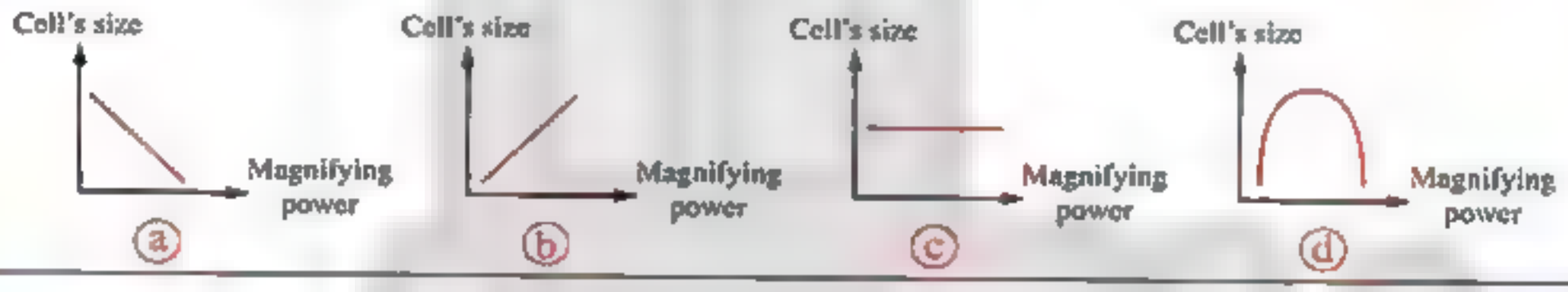
(a) Skeletal muscle fiber contains several nuclei.

(b) Mature red blood cells don't contain nuclei.

(c) New cells are formed by the cellular division.

(d) The cells of the endocrine glands tissue contain nuclei.

8 Which of the following graphs expresses the relation between the size of the cells of a certain tissue in a leaf of the corn plant and the magnifying power of the light microscope lenses that are used in examination ? .....



9 When the magnifying power of the ocular lens for a light microscope is (30x), what is the magnifying power of the objective lens to obtain a maximum magnifying power for this microscope ? .....

(a) (10x). (b) (30x). (c) (50x). (d) (70x).

10 (1) The living organisms are originated spontaneously.

(2) All the living organisms consist of cells.

(3) The cell is the building and functional unit for all the living organisms.

Which one of the previous statements supports the cell theory ? .....

(a) (1) and (2). (b) (2) and (3). (c) (1) and (3). (d) (3) only.

Answer the following questions (11 : 17) :

11 "All the living organisms consist of a group of cells that are attached to each other".

How far this statement is correct ? With explanation.

.....

.....

12 What is the relationship between : the wavelength of the used beam and the contrast of the image that is formed by the microscope ?

13 Explain : the electron microscope is better than the light microscope in the examination.

14 What happens in case of : the staining of *Amoeba* with red eosin during its division ?

15 Through your study for all the types of microscopes, there are several methods to obtain more clear image. Can these methods be used in all cases ?

16 The cell theory was appeared, as a result of the efforts of three scientists, mention the role of each scientist.

17 You read in a newspaper that it was discovered a new prokaryotic organism, in the light of your study of the cell theory, write what did you know about this organism without its seeing or examination.

CHAPTER 2

LESSON ONE

Cell Structure

- **We knew previously that :**
  - The cell is the smallest functional and building unit in all the living organisms.
  - The cell is characterized by its ability to grow, reproduce, respond to the external stimuli and perform the different metabolic processes.
- **We will study :**
  - **How** can the cell perform all these functions ?
  - **What** are the structures that are present in the cell and enable it to perform these functions ?

☆ **In order to answer these questions, we should know the main parts of the cell :**

Cell parts

- Cell is basically made up of a protoplasmic mass that is surrounded by a cell membrane and cell wall or by a cell membrane only.
- **The protoplasm is differentiated into two parts which are :** the nucleus and cytoplasm.
- The cytoplasm contains a group of cellular structures called the cell organelles, and these organelles divide into membranous organelles and non-membranous organelles.

Cell structure

Cell wall and cell membrane

include

- Cell wall.
- Cell membrane (Plasma membrane).

Protoplasm

includes

Nucleus

consists of

- Nuclear envelope.
- Nucleolus.
- Nucleoplasm.
- Chromatin.

Cytoplasm

consists of

Cell organelles

Non-membranous organelles

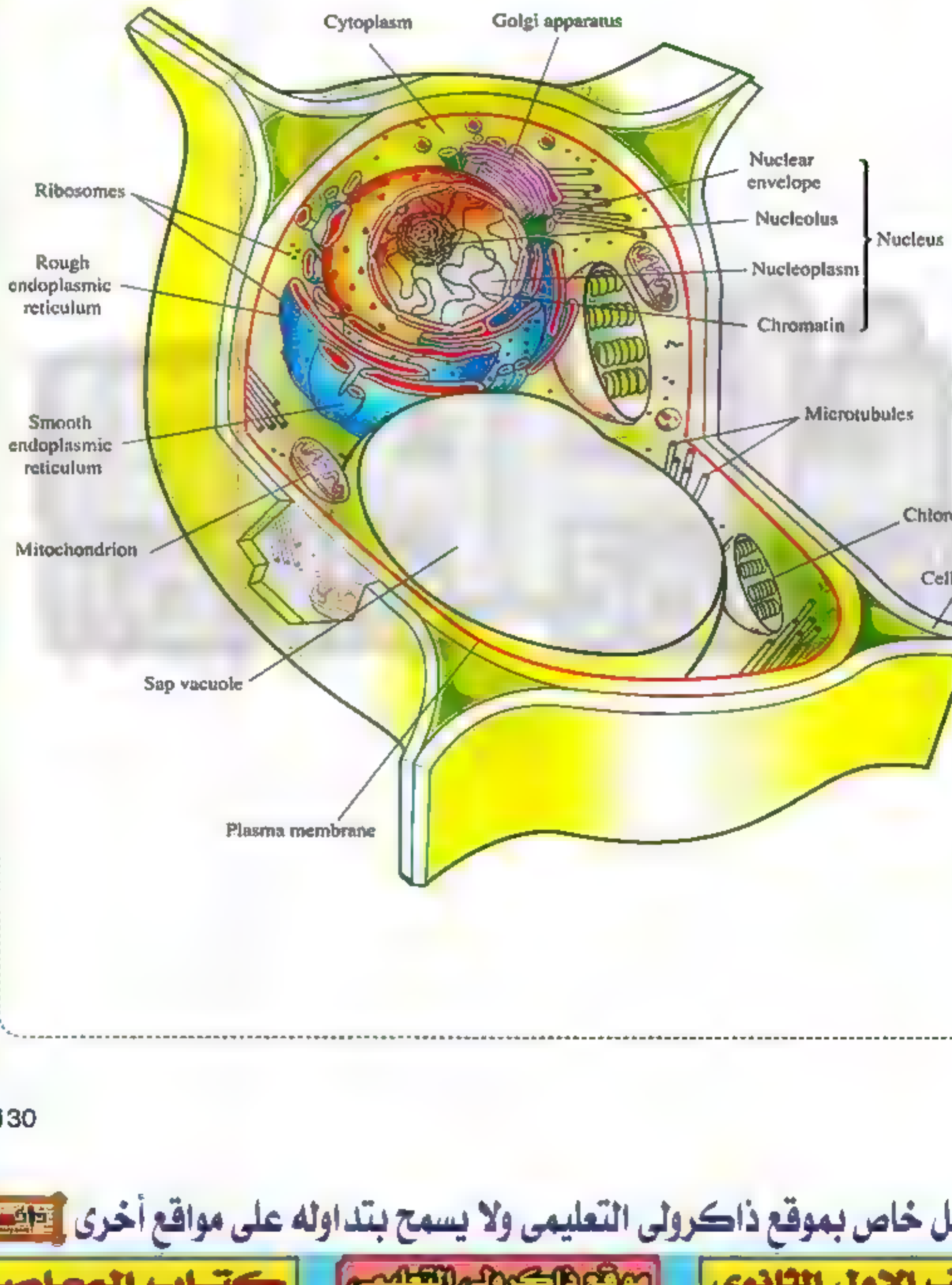
- Ribosomes.
- Centrosome.

Membranous organelles

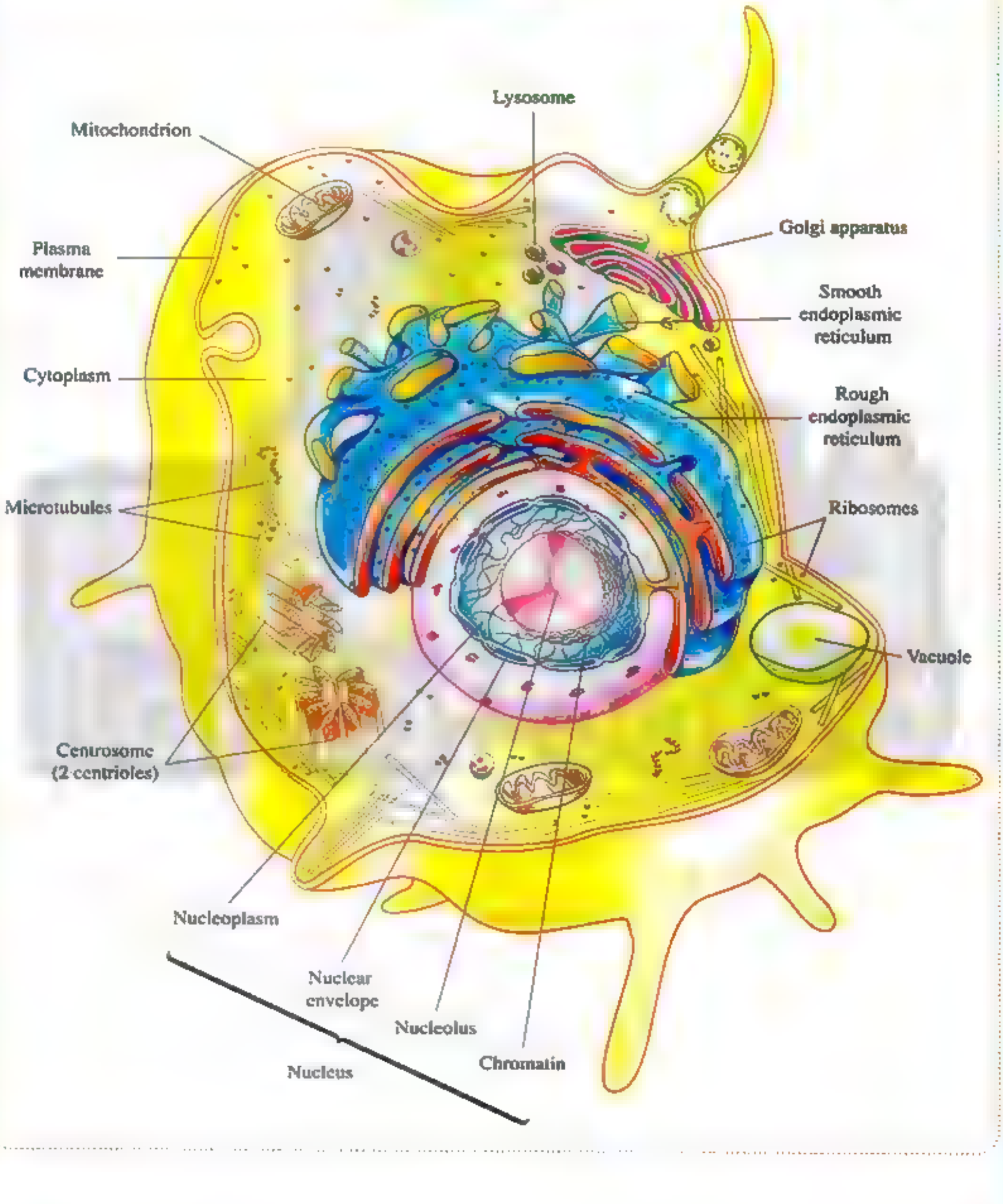
- Endoplasmic reticulum.
- Golgi body.
- Lysosomes.
- Mitochondria.
- Vacuoles.
- Plastids.

UNIT 2

Plant cell



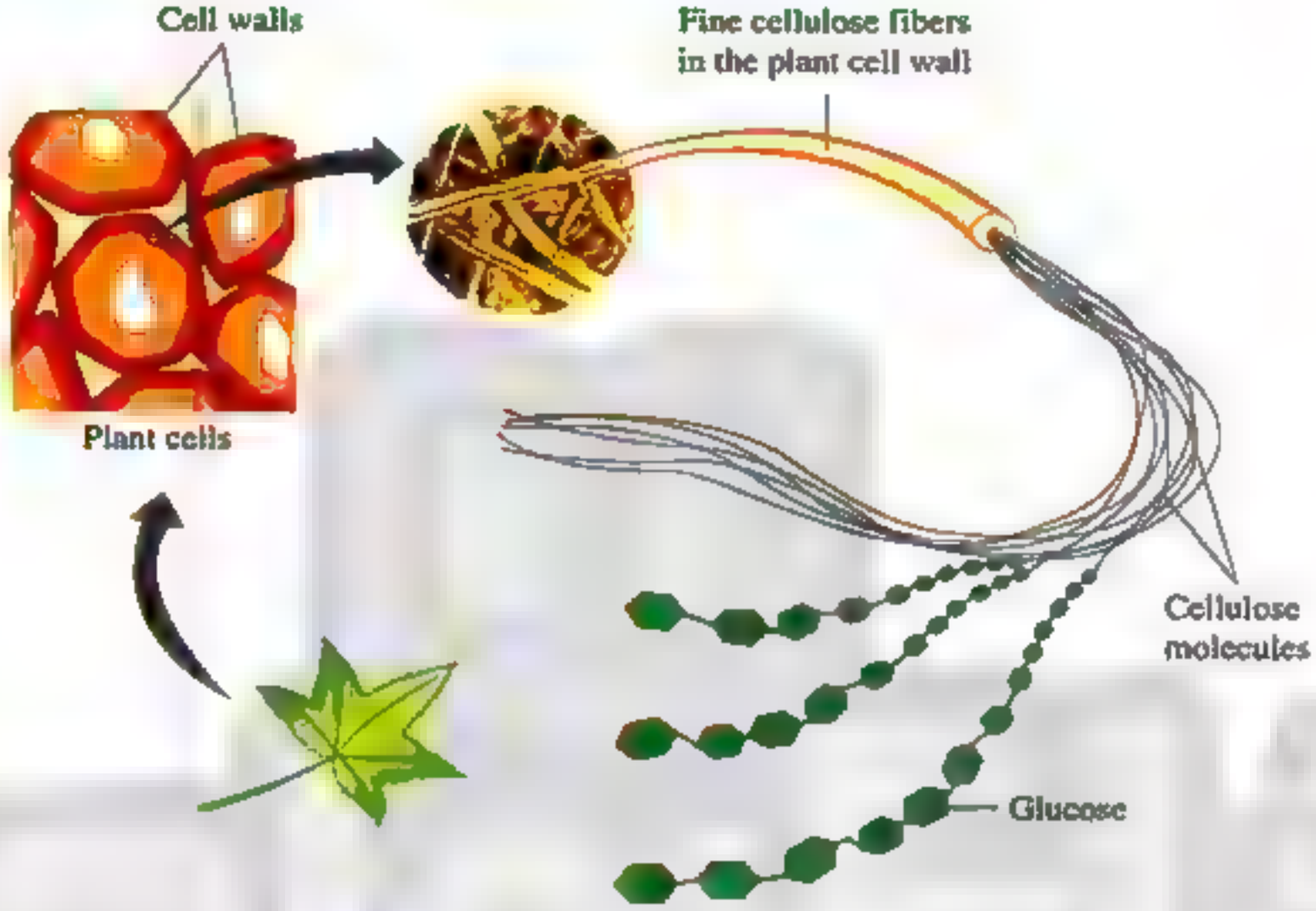
Animal cell



UNIT 2

First Cell walls and cell membranes

1 Cell wall



Location it surrounds the plant cells, algae, fungi and some types of bacteria and it is not present in the animal cells.

Structure it is mainly composed of cellulose fibers.

Functions

1. It supports, protects and gives the cell its characteristic shape.
2. It allows the passage of water and dissolved substances through it easily, because it is pitted.

For illustration only

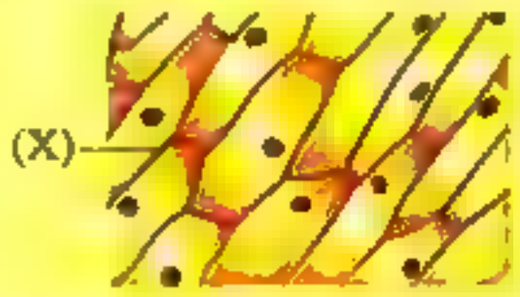
- *The perennial trees such as palm trees are characterized by containing cell walls that play an important role in protecting the cells and making them withstand to wind and other weather factors. These walls provide the cells with strong support.*
- *The small herbal plants are characterized by containing cell walls with a little elasticity that make them be able to maintain their shapes, when they are exposed to strong wind.*

Test yourself

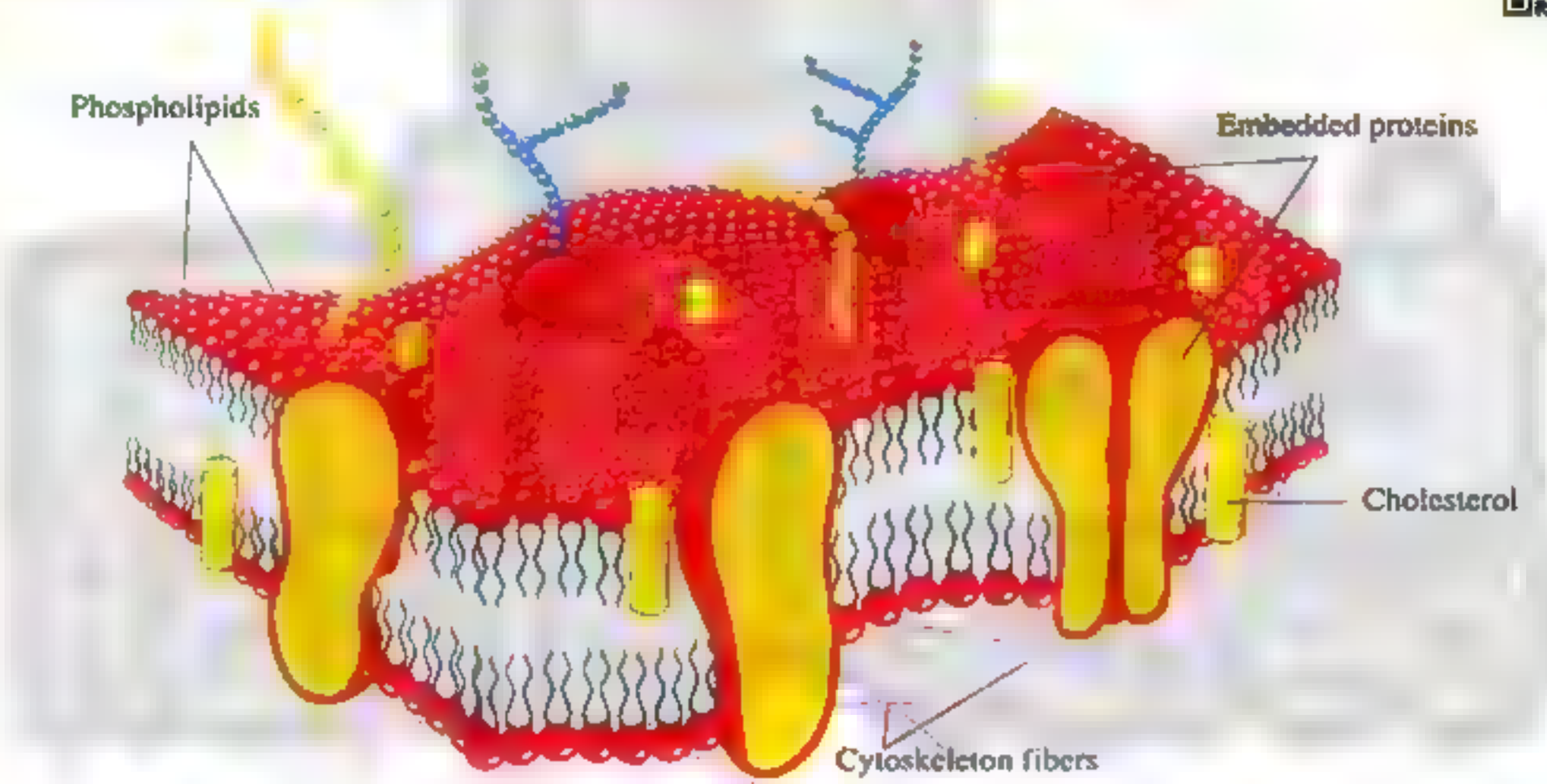
Choose the correct answer :

The following figure illustrates the shape of cells of the onion plant, when examining them under the microscope, we found that the structure (X) is characterized by all of the following, except that .....

ⓐ it is a polymer that is insoluble in water.
ⓑ it is present in all cells of the living organisms.
ⓒ it has a high molecular weight.
ⓓ it is pitted.



2 Cell membrane (Plasma membrane)

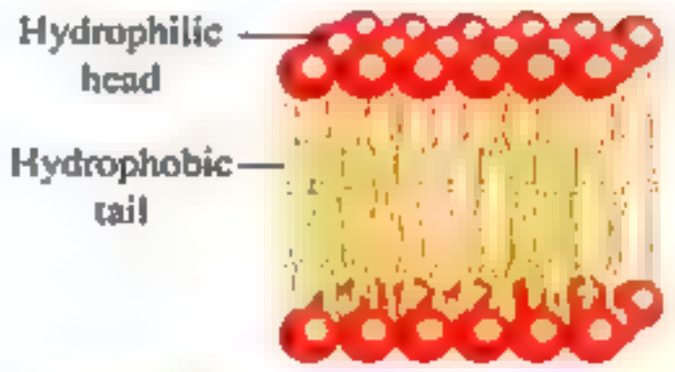


Location it surrounds the cytoplasm of the plant and animal cells.

Structure it is a thin membrane that consists of :

1 **Two layers of the fluid phospholipid molecules, where each one of them consists of :**

- Hydrophilic heads (soluble in water "i.e. interact with water") face the water medium inside and outside the cell.
- Hydrophobic tails (insoluble in water) are present inside the membrane.



Structure of phospholipids molecule

UNIT 2

2 **Molecules of protein embedded among the molecules of these two phospholipids layers, where :**

- Some of them work as cell identification sites for the different substances, such as nutrients, hormones and others.
- Some others work as gates for the passage of substances to and from the cell.

Note

Cell membrane is a fluid structure that is similar to a layer of oil on the water surface, because the phospholipids which form it are considered as a fluid substance.

3 **Molecules of the cholesterol substance** linked with phospholipid molecules for maintaining the cell membrane cohesive and intact.

Functions

1 It covers the cell and separates its contents from the surrounding medium. Therefore, it prevents the spreading out of the protoplasm outside the cell.

2 It performs a main role in organizing the passage of substances to and from the cell.

☆ **From the previous, it can hold a comparison between the cell wall and cell membrane, as follows :**

P.O.C.	Cell wall	Cell membrane (Plasma membrane)
Location :	It surrounds the plant cells, algae, fungi and some types of bacteria and it doesn't surround the animal cells.	It surrounds the cytoplasm of the plant and animal cells.
Structure :	It consists mainly of cellulose fibers.	• It consists of two layers of phospholipids, where : - Protein molecules embedded among their molecules. - They linked with the molecules of the cholesterol substance.
Description :	Pitted envelope.	Thin membrane that is similar to the oil layer on the water surface.
Functions :	(1) It supports, protects and gives the cell its characteristic shape. (2) It allows the passage of water and dissolved substances through it easily, because it is pitted.	(1) It covers the cell and separates its contents from the surrounding medium. Therefore, it prevents the spreading out of the protoplasm outside the cell. (2) It plays a main role in regulating the passage of substances to and from the cell.

Test yourself

1 Choose the correct answer :

(1) The lipid derivative that enters in the structure of the plasma membrane is .....

ⓐ phospholipid. ⓑ cholesterol. ⓒ wax. ⓓ steroid.

(2) The plasma membrane regulates the substances that pass from and to the cell, because .....

ⓐ it is completely permeable. ⓑ it is completely impermeable.

ⓒ it is partially permeable. ⓓ no correct answer.

2 The cytoplasm of the plant cell is surrounded by structures that are different from each other in their physical properties. **Explain this.**

.....

.....

.....

Second Protoplasm

Nucleus

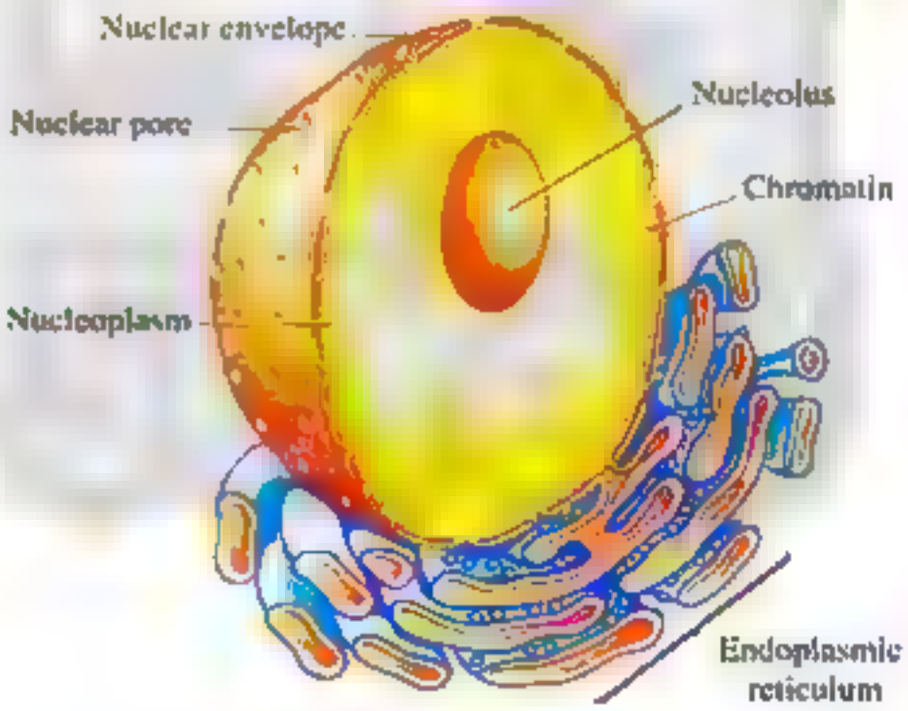
Description

It has a spherical or oval shape, which is the most obvious organelle in the cell that can be seen under the microscope.

Location

It is often located in the centre of the cell.

Structure **the nucleus is composed of :**



Nucleus

1 Nuclear membrane (envelope) :	• It is a double membrane that surrounds the nucleus and separates its contents from the cytoplasm. • There are several tiny pores in it through which the substances pass between the nucleus and cytoplasm.
2 Nucleoplasm :	• It is a transparent gelatinous fluid inside the nucleus. • It contains the nucleolus and chromatin.

UNIT 2

③ **Nucleolus :**	• More than one nucleolus may be found in the nucleus, especially in the cells that form and produce proteins, such as : enzymes, hormones and others.
④ **Chromatin :**	• It is minute tangled filaments that are coiled around each other. • During the cell division, it changes into rod-like structures called chromosomes.

Test yourself

Choose the correct answer :

(1) All the following are from the nucleus components, except the .....

ⓐ endoplasmic reticulum. ⓑ nucleolus.

ⓒ chromatin reticulum. ⓓ nuclear envelope.

(2) The nuclear envelope is similar to the cell wall in .....

ⓐ the type of polymer that is present in each one of them.

ⓑ the presence of pores in both of them. ⓒ the direct connection with the cytoplasm.

ⓓ its presence in all the cells.

Chromosome

1 During the metaphase of the cell division, the chromosome appears more obvious, which consists of two filaments, where each filament of those is called **chromatid**. The two chromatids are joined together by a central part called the **centromere**.

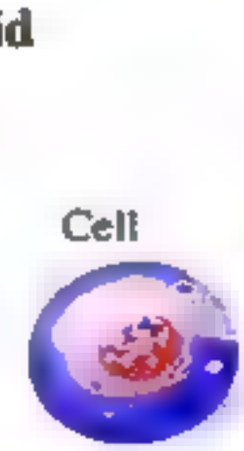
Origin of word "Chromosome"

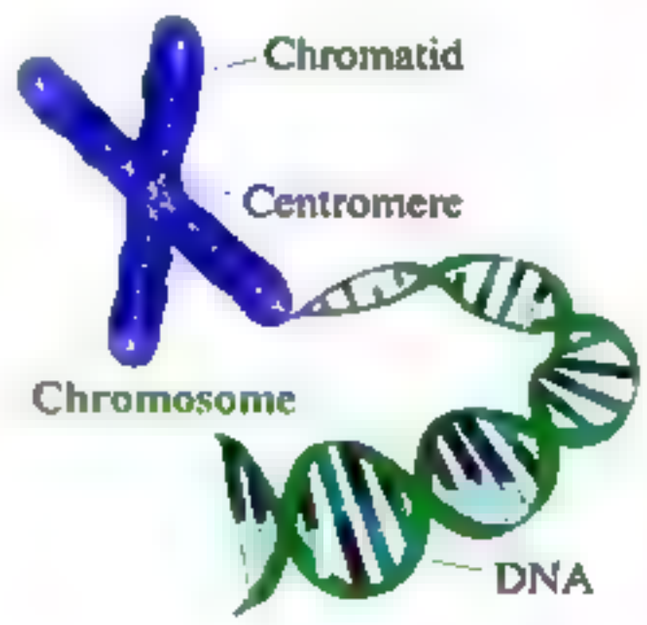
Chromosomes were called by this name, because they are stained by basic dyes. So, they appear coloured, making them seen more clearly during the cell division process.

2 Each chromatid is composed of the **nucleic acid DNA** coiled around protein molecules that are called the **histones**.

3 **DNA carries the genetic information (genes) that :**

- Control the shape and structure of the cell.
- Organize the vital activities of the living organism.
- Through them the genetic traits are transferred from a generation to another through the reproduction process.





For illustration only

- ***Chromosome is not consisted of two chromatids in all the phases of mitosis, where the chromosome :***
  - *Consists of two chromatids at the beginning of mitosis, till its metaphase.*
  - *Consists of one chromatid in anaphase, telophase and called daughter chromosome.*
  - *At the beginning of each new cellular division, its genetic material is duplicated to become consisted of two chromatids.*
- *Chromosomes represent the chromatin reticulum in the cell nucleus.*

Test yourself

Choose the correct answer :

(1) The pores that are present in the nuclear membrane act on .....

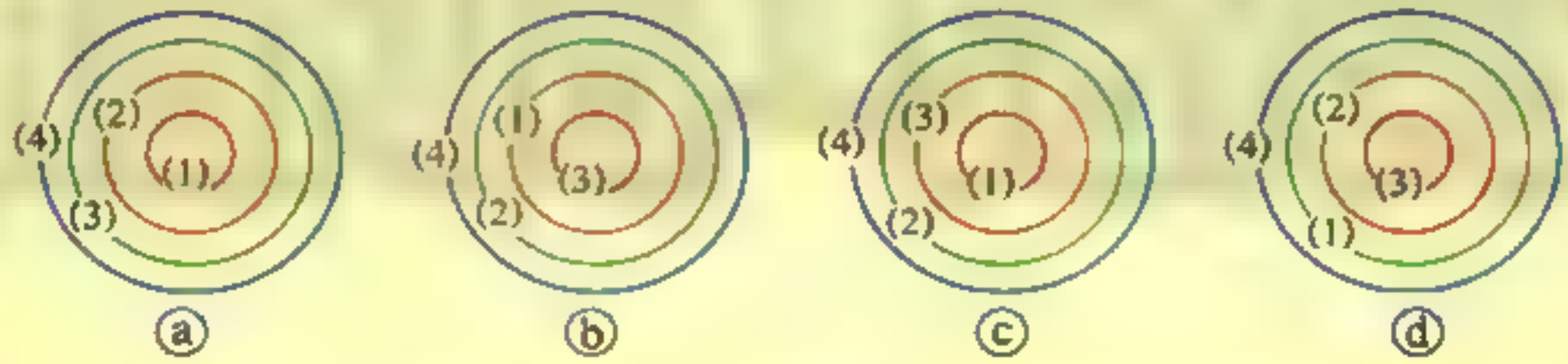
ⓐ transferring RNA molecules into the cytoplasm to synthesize the proteins.

ⓑ transferring DNA molecules into the cytoplasm to synthesize the proteins.

ⓒ transferring each of DNA and RNA molecules into the cytoplasm to synthesize the proteins.

ⓓ transferring the ribosomes into the nucleus to synthesize the proteins.

(2) If you knew that the labels are (1) "chromosome", (2) "nucleus", (3) "gene" which are the structures inside (4) "living cell", which of the following figures represents the correct arrangement of the labels ? .....



CHAPTER 2

QUESTIONS ON LESSON One

Cell Structure

Interactive test

The questions signed by ✓ measure the high levels of thinking.

First Multiple Choice Questions

1 ✓ The opposite figure illustrates a part of *Spirogyra* alga on its examining under the microscope, study it, then answer :

(1) The structure (X) that separates between two neighbouring cells in the alga consists of .....
ⓐ carbohydrates. ⓑ proteins. ⓒ lipids. ⓓ phospholipids.

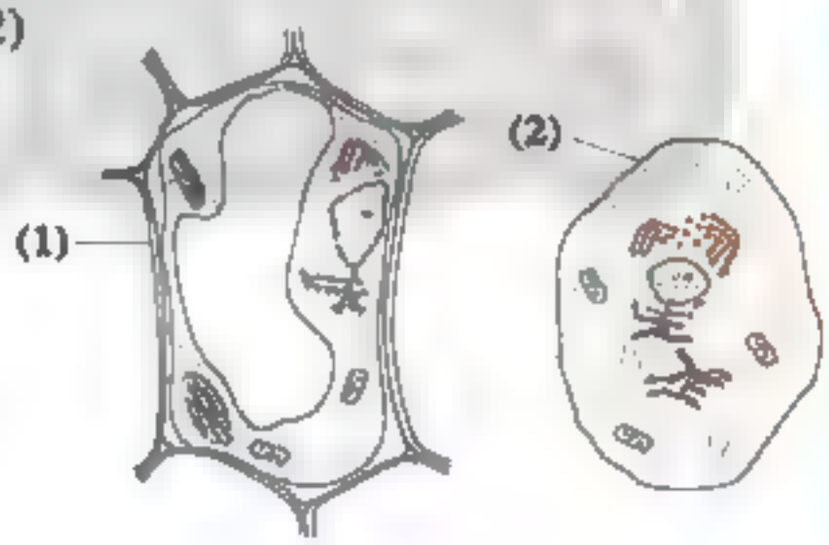
(2) The building unit that enters in the structure (X) is .....
ⓐ glucose. ⓑ amino acid. ⓒ fatty acid. ⓓ glycerol.

(3) The structure (X) consists chemically of .....
ⓐ biological micro-molecules. ⓑ biological macro-molecules.
ⓒ biological macro and micro-molecules. ⓓ inorganic molecules.

(4) The structure (Y) refers to .....
ⓐ green plastids. ⓑ nucleus. ⓒ nucleolus. ⓓ sap vacuole.

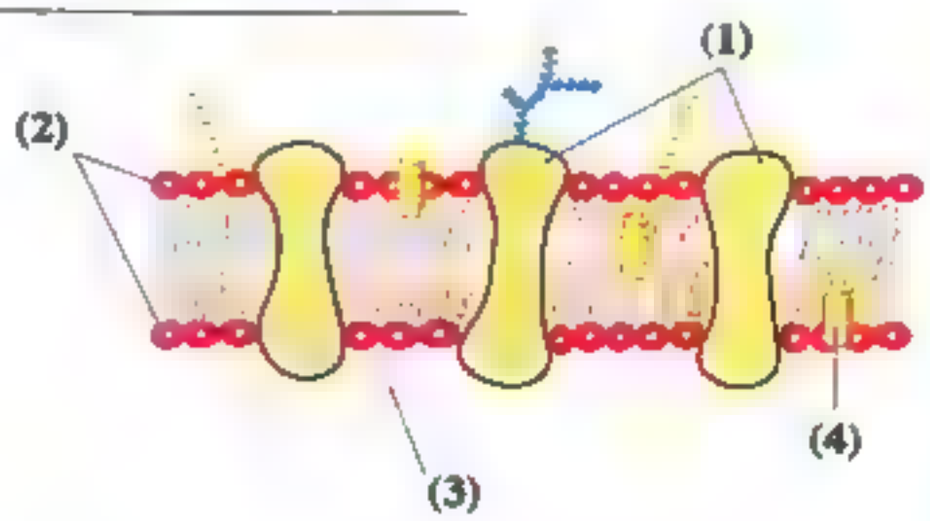
2 Which of the following substances determines the shape of a corn plant cell ? .....
ⓐ Proteins and cellulose. ⓑ Lipids and proteins.
ⓒ Lipids only. ⓓ Cellulose only.

3 From the two opposite figures, the parts no. (1) and (2) have the same characteristic of the following ones which is .....



ⓐ the presence of pores.
ⓑ the separation between the cell contents and its surrounding medium.
ⓒ the control of the passage of substances.
ⓓ the liquid state for each one of them.

4 ✓ The opposite figure represents a part of the living cell, study it, then answer :



(1) Which part in this figure attaches with the cell organelles ? .....
ⓐ (1). ⓑ (2).
ⓒ (3). ⓓ (4).

(2) Which of the following parts has a role in choosing certain substances to enter the cell ? .....

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

(3) The previous figure consists of ..... compounds.

ⓐ homogenous ⓑ heterogenous

ⓒ homogenous and heterogenous ⓓ similar

5 The hormones are secreted from the endocrine glands and are released directly into the blood, but they affect some cells (effector cells) that recognize the hormones by .....

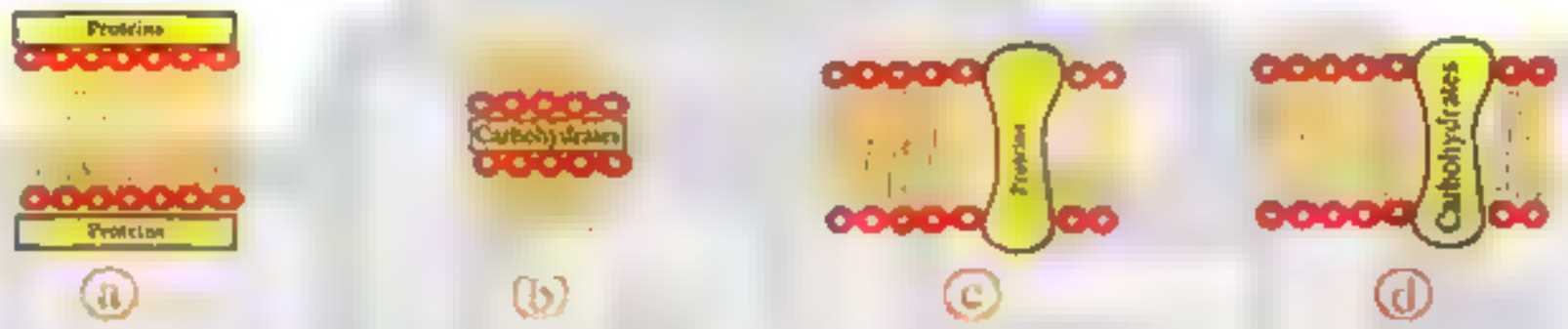
ⓐ plasma membrane phospholipids. ⓑ plasma membrane proteins.

ⓒ cell secretions. ⓓ plasma membrane cholesterol.

6 The complex lipid(s) that enter(s) in the structure of the plasma membrane is(are) .....

ⓐ phospholipid. ⓑ cholesterol. ⓒ waxes. ⓓ steroids.

7 Which of the following figures represents the plasma membrane of the cell ? .....



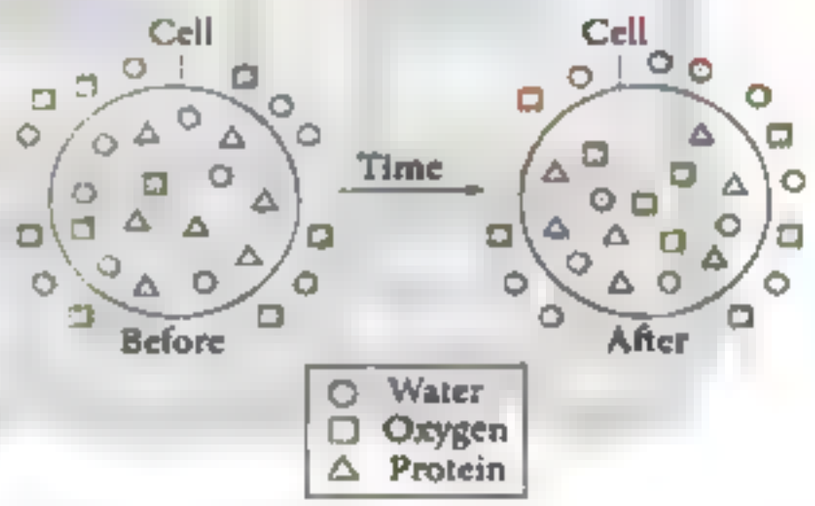
8 From the opposite figure, what is the reason for obstructing the movement of protein molecules from the inside to the outside of the cell ? .....

ⓐ Temperature.

ⓑ pH value.

ⓒ Size of molecules.

ⓓ Concentration of molecules.



9 Two layers of the phospholipids in the plasma membrane face to each other through .....

ⓐ hydrophilic tails. ⓑ hydrophilic heads. ⓒ hydrophobic heads. ⓓ hydrophobic tails.

10 Which of the following choices represents the structure of the plasma membrane of the plant cell ? .....

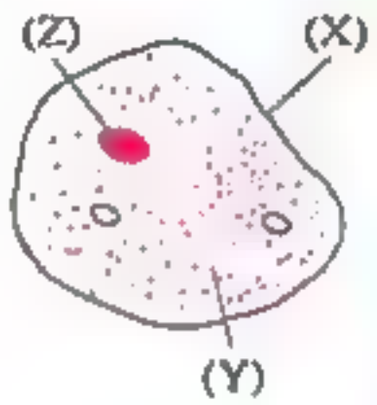
	Carbohydrates	Proteins	Simple lipids	Complex lipids	Lipid derivative
ⓐ	✓	✓	✗	✓	✓
ⓑ	✗	✓	✗	✓	✓
ⓒ	✓	✓	✓	✓	✗
ⓓ	✗	✗	✓	✓	✗

Present	✓
Absent	✗

UNIT 2

11 Two layers of the phospholipids in the cell membrane are attached to the fluid that is found inside and outside the cell by .....
(a) hydrophilic heads and hydrophobic tails respectively.
(b) hydrophobic tails and hydrophilic heads respectively.
(c) hydrophilic heads.
(d) hydrophobic tails.

12 The opposite figure represents an animal cell, which of the following structures is found in a plant cell ? .....



	(X)	(Y)	(Z)
(a)	✓	✓	✓
(b)	✗	✗	✓
(c)	✓	✓	✗
(d)	✗	✓	✗

13 Which of the following statements is correct ? .....
(a) DNA in the cell consists of protein.
(b) Protein consists of DNA and is stored in the cell.
(c) DNA controls the formation of protein in the cell.
(d) The cell consists of DNA and protein.

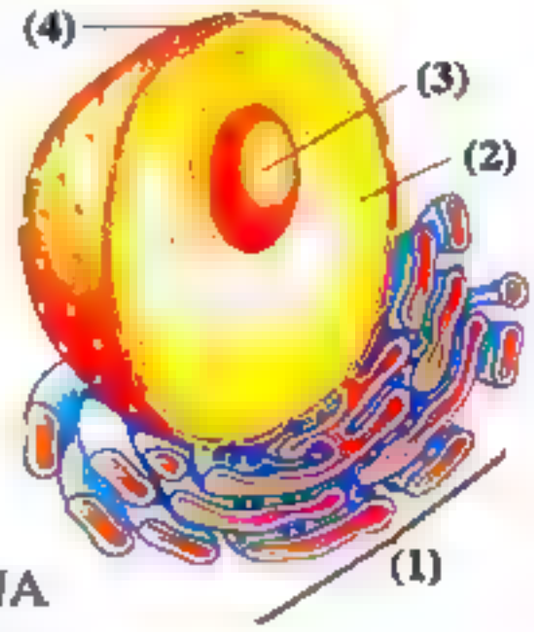
14 In the plant cell, the nucleic acid (RNA) transfers to the cytoplasm through the .....
(a) endoplasmic reticulum. (b) pores of the nuclear membrane.
(c) cell membrane. (d) pores of the cell wall.

15 If the pores of the nuclear membrane are absent, the formation of ..... stops.
(a) carbohydrates (b) proteins (c) lipids (d) nucleic acids

16 Histone proteins are similar to the enzymes in all of the following, except .....
(a) both of them are from the same type of monomers.
(b) both of them have peptide bonds.
(c) both of them enter in the metabolic processes.
(d) both of them are detected by Biuret's reagent.

17 The centromere appears in .....
(a) chromatid. (b) chromatin. (c) chromosome. (d) nucleoplasm.

18 The opposite figure represents a part of the living cell, study it, then answer :



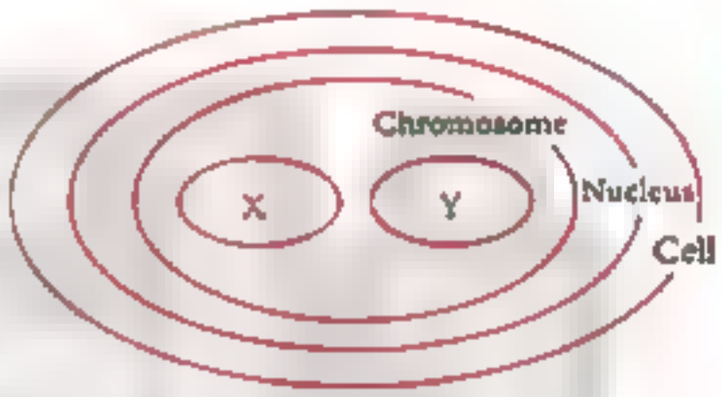
(1) The part that is not considered from the components of the nucleus is .....
ⓐ (1). ⓑ (2).
ⓒ (3). ⓓ (4).

(2) The part that carries genes is .....
ⓐ (1). ⓑ (2).
ⓒ (3). ⓓ (4).

(3) The part no. (2) consists of .....
ⓐ lipids and DNA ⓑ proteins and DNA
ⓒ proteins and RNA ⓓ lipids and proteins.

(4) When the structure no. (3) is absent, the disturbance of ..... production occurs.
ⓐ proteins ⓑ carbohydrates ⓒ lipids ⓓ mineral salts

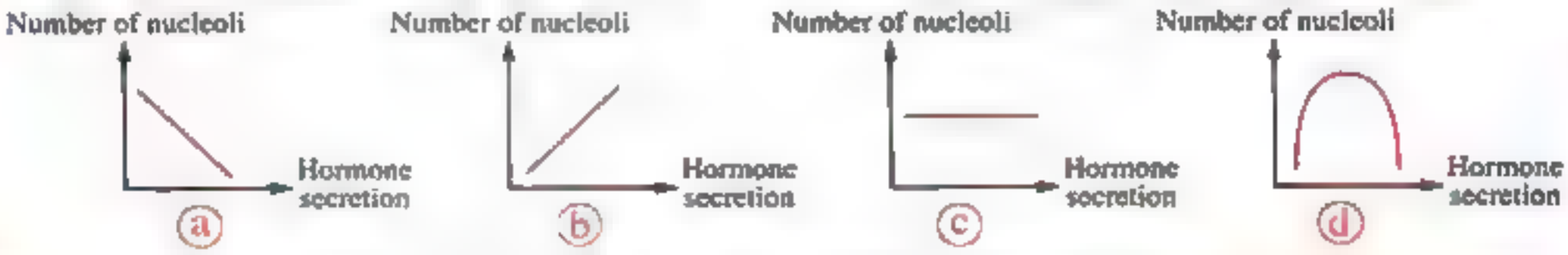
19 The opposite diagram represents a cell of a living organism, what do the symbols (X) and (Y) represent ? .....



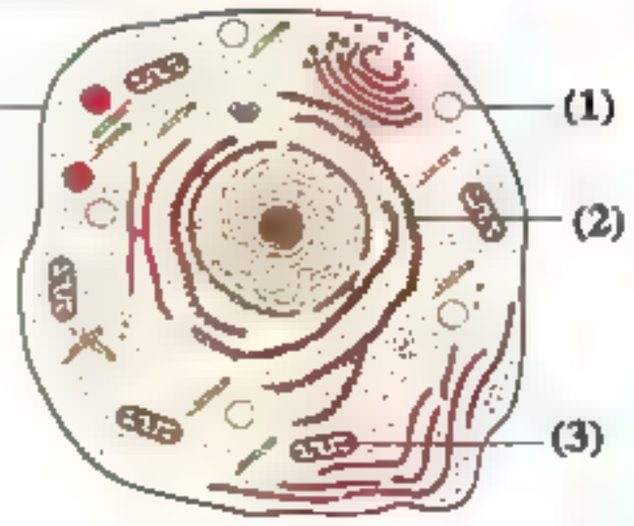
ⓐ ATP and monosaccharides.
ⓑ Protein and DNA
ⓒ Nucleotides and ATP
ⓓ Monosaccharides and phosphate groups.

20 The number of DNA molecules in a cell of a living organism that contains 10 chromosomes in anaphase during the mitotic division is .....
ⓐ 5 ⓑ 10 ⓒ 15 ⓓ 20

21 Which graph expresses the relation between the number of nucleoli inside the cells and the secretion of hormones ? .....



22 From the opposite figure, which of the following parts is used in the production of ATP molecules ? .....



ⓐ (1). ⓑ (2).
ⓒ (3). ⓓ (4).

UNIT 2

Second Miscellaneous Questions

1 Give reason for : water passes easily from the outside to the inside of the plant cell.

2 What happens if : the plasma membrane consists of one layer only ?

3 What happens if : the tails that are found in the two layers of phospholipids are hydrophilic ?

4 What is the importance of the complex lipids in the cell membrane ?

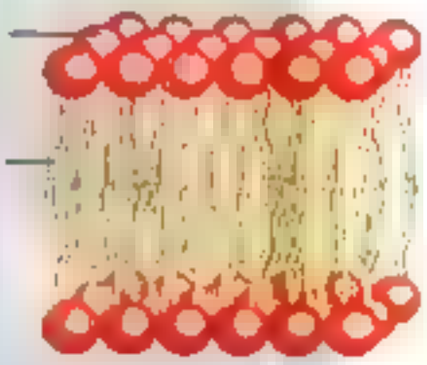
5 Write what does this statement indicate :
"An organic compound contains saturated lipids and it is characterized by being liquid".

6 What is the importance of the lipid derivative in the cell membrane ?

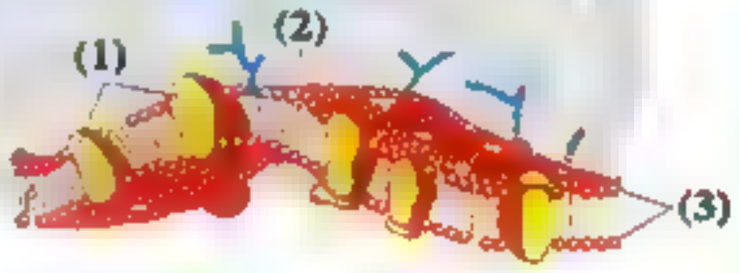
7 What happens if : the plant cell doesn't contain the plasma membrane ?

8 What happens in case of : the absence of the protein molecules from the plasma membrane ?

9 The opposite figure represents a part of the plasma membrane :
Can the structure no. (1) replace the structure no. (2) ?
Explain your answer.



10 From the opposite figure :
(a) **Determine** the molecular structure of part no. (3).
(b) **What** is the importance of part no. (1) and no. (2) ?
(c) **What** are the building units that form part no. (1) ?

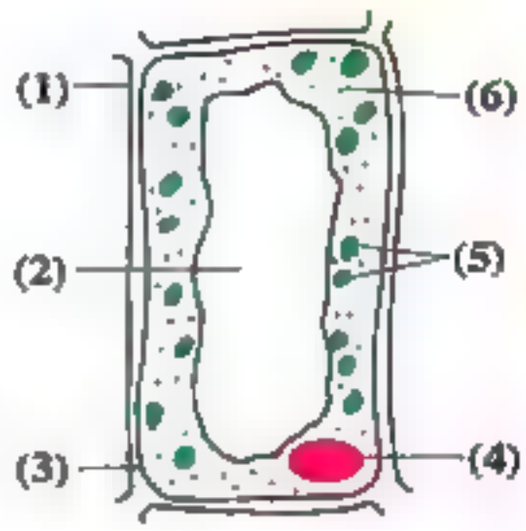


11 What are the similarities and the differences between : the cell wall and the cell membrane ?

12 What happens if :
- Phospholipids molecules are not linked with the molecules of the cholesterol substance in the cell membrane.
- The cholesterol substance is absent from the cell membrane.

13 "Nuclear membrane has a role in the protein synthesis".
How far this statement is correct ? With explanation.

14 The opposite figure illustrates a plant cell, study it, then write the number and the name of the structure that indicates each of the following statements :



(a) It consists of a complex sugar.

(b) Lipids and proteins enter in its structure.

(c) It contains the genetic information needed to form the protein.

(d) The synthesis of proteins is occurred in it.

15 What happens when : the chromatin is absent from the structure of the nucleus ?

16 What is the relationship between chromatin and chromatid ?

17 The opposite table illustrates two organic compounds (X) and (Y), where each one of them consists of saturated fatty acids and glycerol, but they differ in the physical state, study it, then answer :

	Liquid state	Solid state
(X)	✓	✗
(Y)	✗	✓

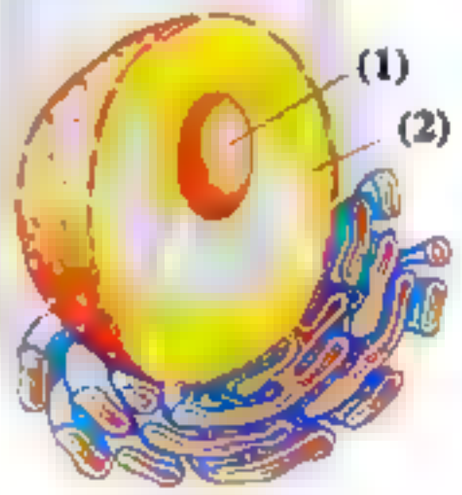
(a) **What** do the two compounds (X) and (Y) represent ?

(b) **What** is the molecular structure of the compound (X) ?

(c) **What** is the function of the compound (Y) ?

(d) **Give an example for** the site of each of compound (X) and (Y).

18 From the opposite figure :



(a) **What is the relationship between** the structure no. (2) and the control of the shape and structure of the cell ?

(b) **What is the relationship between** the structure no. (1) and the synthesis of some hormones ?

19 "There is a relationship between the nucleus and the appearance of the genetic traits". How far this statement is correct ? With explanation.

20 Study the three opposite figures, **then illustrate** the relationship between them.

Figure (1)

Figure (2)

Figure (3)

CHAPTER 2

LESSON Two

Continue : Cell Structure

Cytoplasm

Location it fills the space between the cell membrane and the nucleus.

Structure it is a fluid-like (semi-liquid) substance that is composed mainly of water, some organic and inorganic substances.

Contents it contains :

1. **Cytoskeleton :** it is a network of threads and microtubules **which :**
   - Acquires the cell with a support to help it in maintaining its shape and form.
   - Works as the passages to transport the different substances from a place to another inside the cell.
2. **Cell organelles :** they are a group of various structures which are **divided into :**

Non-membranous organelles	Membranous organelles
• They are not surrounded by a membrane.	• They are surrounded by a membrane.
Examples	
- Ribosomes. - Centrosome.	- Endoplasmic reticulum. - Lysosomes. - Vacuoles. - Golgi body. - Mitochondria. - Plastids.

Test yourself

Choose the correct answer :

(1) All the following contain membranes, except the .....

ⓐ nucleus. ⓑ cytoplasm microtubules.

ⓒ Golgi bodies. ⓓ mitochondria.

(2) Which of the following keeps the shape and structure of the plant cell ? .....

ⓐ Cell wall only. ⓑ Cell membrane only.

ⓒ Microtubules in the cytoplasm only. ⓓ (a) and (c) together.

A Non-membranous organelles

1 Ribosomes

Description they are non-membranous round-shaped organelles.

Location

1 Some of them are present free in the cytoplasm (single or in clusters) "The least number".	To produce and release protein directly into the cytoplasm, so that the cell uses it in its vital processes, such as growth, regeneration and others.
2 Others are attached to the outer surface of the endoplasmic reticulum "The largest number".	To produce proteins (as enzymes) that are transported by the endoplasmic reticulum to outside the cell after making some changes on them in Golgi body.

Function they are responsible for synthesizing the protein in the cell.

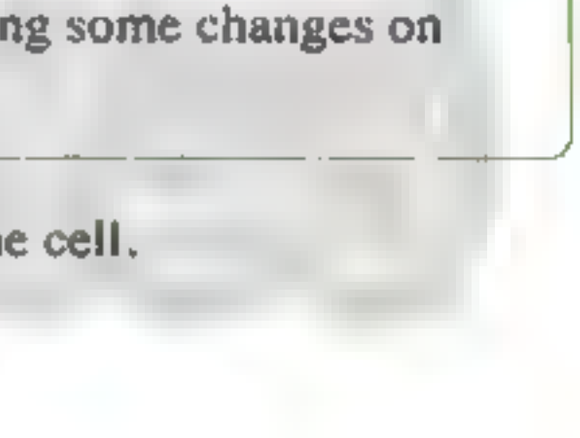
2 Centrosome

Location

- **It is located** in some animal cells (except the nerve cells) and some fungal cells near to the nucleus in a region of the cytoplasm.
- **It is not present** in the cells of the plants, algae and most fungi, where these cells contain a region of cytoplasm instead of the centrosome which performs the same function.

Structure

- It consists of two tiny particles called **"centrioles or centrosome"**.
- Each centriole consists of 9 groups of microtubules that are arranged in triplets in a cylindrical shape.



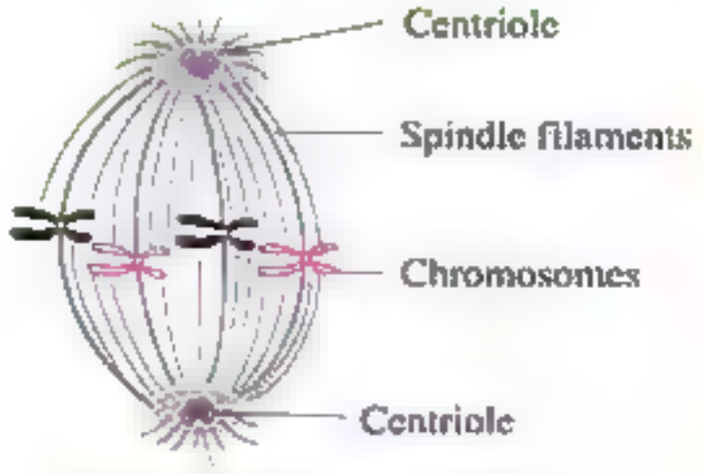
The two centrioles

UNIT 2

Functions

It plays an important role :

1. During the cell division, where the spindle filaments extend between the two centrioles that are present at each pole of the cell. So, these centrioles withdraw the chromosomes towards the cell poles to help in the cell division.
2. In the formation of flagella and cilia.



The role of centrosome during the cell division

Notes

(1) **Centromere :** it is the point of connection of two chromatids of a chromosome.
(2) **Centrosome :** it consists of two centrioles.

Test yourself

Choose the correct answer :

(1) The free ribosomes are present in large numbers in .....
- (a) the secretory cells for the digestive enzymes.
- (b) the cells that produce the cytoplasm proteins.
- (c) the cells that produce the steroids.
- (d) the secretory cells for the thyroxine hormone.

(2) The number of microtubules in a centriole of the centrosome is .....
(a) 3 (b) 9 (c) 27 (d) 54

(3) The centrosome is present in the .....
- (a) centre of the chromosome.
- (b) centre of the nucleus.
- (c) plasma membrane.
- (d) cytoplasm.

B Membranous organelles

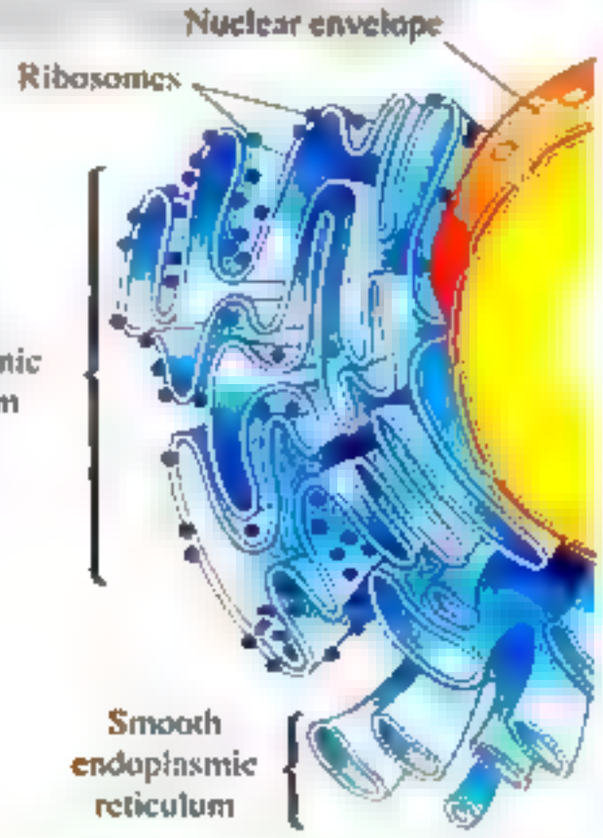
1 Endoplasmic reticulum

Description

It is a network of membranous canaliculi.

Location

It extends through all the parts of the cytoplasm and attaches to the nuclear envelope and cell membrane.



Endoplasmic reticulum

Functions

1. It forms an internal transport system that benefits in transferring the substances from a part to another inside the cell.
2. It transfers the substances between the nucleus and cytoplasm.

Types there are two types of endoplasmic reticulum, **which are :**

	① Rough endoplasmic reticulum	② Smooth endoplasmic reticulum
The presence of ribosomes :	It is characterized by the presence of a large number of ribosomes on its outer surface.	Ribosomes are absent from it.
Functions :	(1) Synthesizing proteins in the cell. (2) Making changes on proteins that are produced (secreted) by the ribosomes. (3) Making new membranes in the cell.	(1) Synthesizing lipids in the cell. (2) Transforming glucose into glycogen. (3) Modifying the nature of some toxic chemicals to reduce their toxicity (harmful effects).
Sites of abundance :	Its presence increases in the stomach lining cells and endocrine glands, as these cells are responsible for the secretion of enzymes and hormones.	• Its presence increases in the hepatic (liver) cells, where : - Glucose sugar is converted into glycogen that is stored in liver. - Some toxic compounds are converted into less toxic ones.

3 Test yourself

Choose the correct answer :

(1) Which of the following represents the communication system among the different cell organelles ? .....

ⓐ Endoplasmic reticulum. ⓑ Nerve cells.
ⓒ Ribosomes. ⓓ Centrosome.

(2) The cell that doesn't contain rough endoplasmic reticulum .....

ⓐ doesn't contain ribosomes. ⓑ contains ribosomes.
ⓒ doesn't form proteins. ⓓ forms digestive enzymes.

(3) Which of the following organelles is(are) present more in the cells of liver of a worker in an insecticide company ? .....

ⓐ Ribosomes. ⓑ Rough endoplasmic reticulum.
ⓒ Smooth endoplasmic reticulum. ⓓ Golgi bodies.

UNIT 2

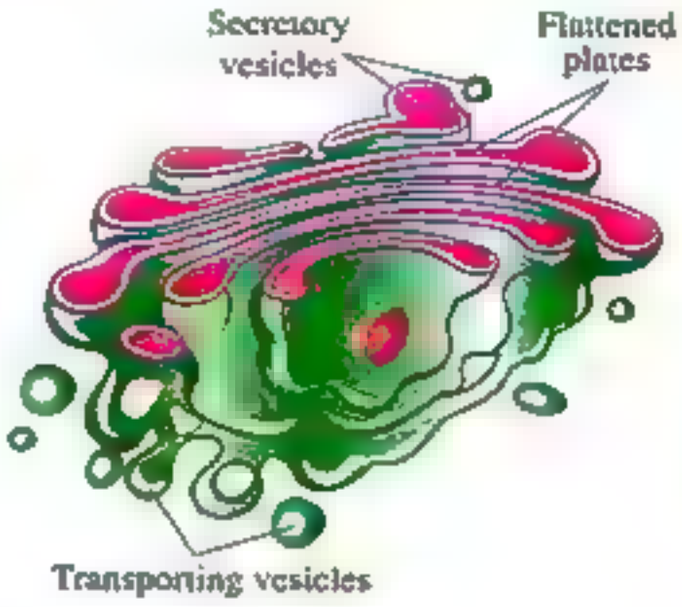
2 Golgi body (Golgi apparatus)

Description

It is a group of flat membranous round-ended sacs.

Number

The number of Golgi bodies in the cell differs according to the cell's secretion activity, where it increases in the glandular cells.

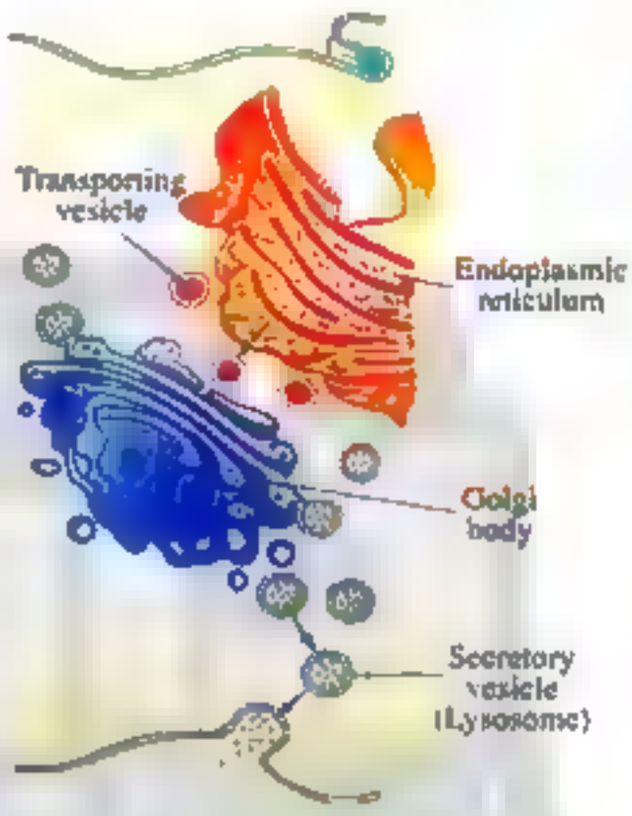


Golgi body

Function

It plays an important role in the formation of the cell secretions, where it performs its function in several stages, **as follows :**

1. It receives the molecules that are secreted by the endoplasmic reticulum through a group of transporting vesicles.
2. It classifies and modifies these molecules of substances.
3. It distributes these substances to the places where they are used inside the cell or it may pack them inside secretory vesicles called "lysosomes" that move toward the cell membrane, where the cell expels them to the outside as secretory products.



The role of Golgi body in the formation of secretory vesicles

Origin of the word "Golgi apparatus"

- Golgi apparatus was named for its discoverer, the Italian anatomist and pathologist Camillo Golgi who described it for the first time in 1898
- Golgi apparatus is also known as **Golgi complex**. It is also known as dictyosomes in the plants and algae.

3 Lysosomes (Secretory vesicles)

Description

They are small-sized, round-shaped and membranous vesicles, where they are formed by **Golgi bodies** and contain inside them a group of **digestive enzymes** (lysosomal enzymes).

Functions

1. Getting rid of worn out and senile cells and organelles which have no longer benefits to the cell.

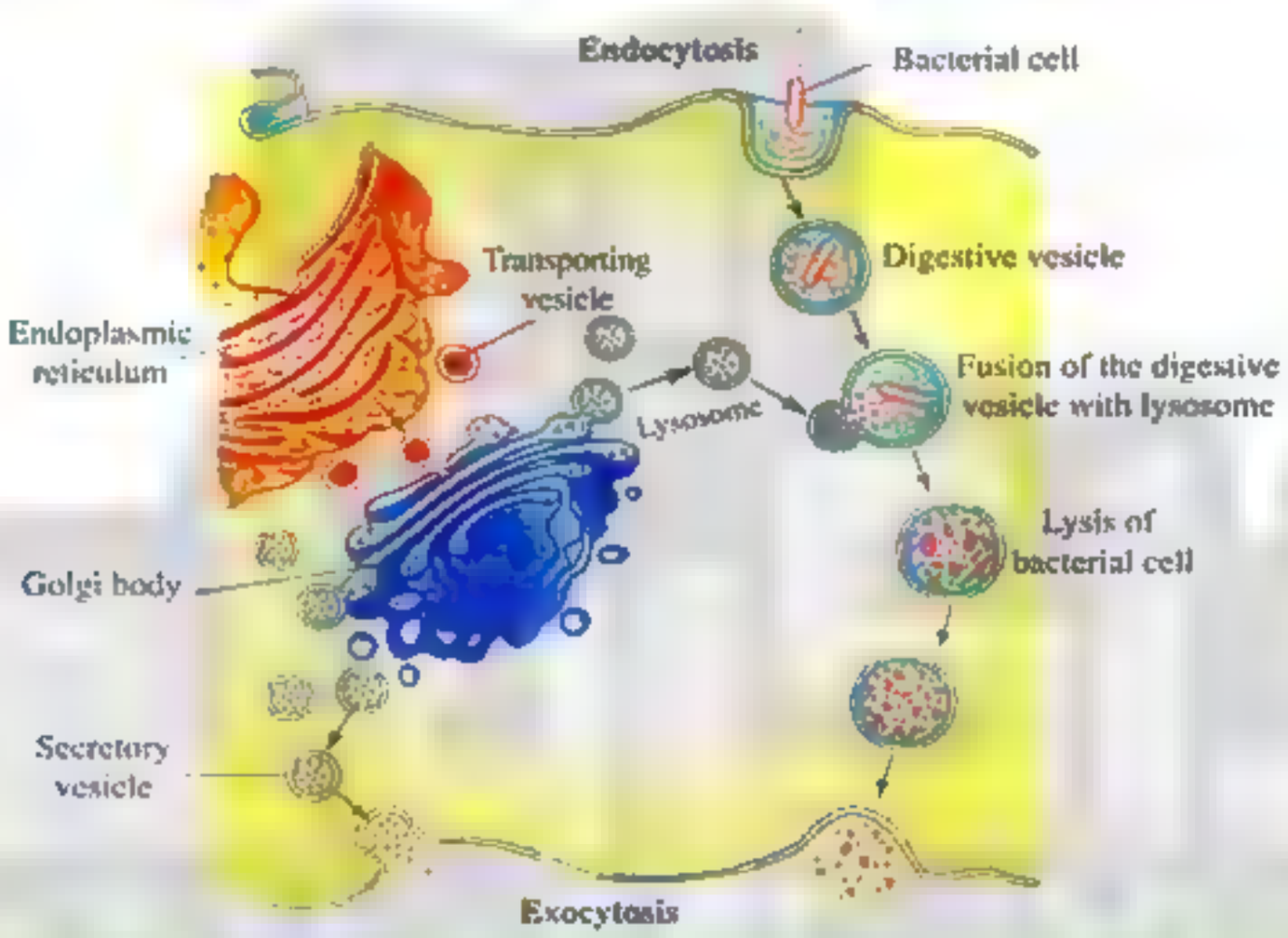
2 Digesting the large molecules of nutrients that are engulfed by the cell and changing them into simpler substances structurally that the cell can make benefit from them.

Note

The cell is not affected by the enzymes of lysosomes, because these enzymes are surrounded by a membrane that isolates them from the cell components.

- **Example :**

White blood cells (corpuscles) use the digestive enzymes that are present inside the lysosomes to digest and destroy the pathogens (as microbes) which invade the cell.



Role of lysosomes in digesting and lysing the pathogens inside a white blood cell

Test yourself

Choose the correct answer :

(1) The action of Golgi body is attached with the endoplasmic reticulum by a group of .....

ⓐ secretory vesicles. ⓑ digestive vesicles.

ⓒ transporting vesicles. ⓓ vacuoles.

(2) Each of the following is present in the cells of *Spirogyra* alga, except .....

ⓐ cell wall. ⓑ cell membrane. ⓒ dictyosome. ⓓ centrosome.

(3) The exocytosis of a pathogen is preceded directly by .....

ⓐ the endocytosis process.

ⓑ secreting the transporting vesicles from the endoplasmic reticulum.

ⓒ secreting the secretory vesicles from Golgi body.

ⓓ fusing the digestive vesicles with lysosome.

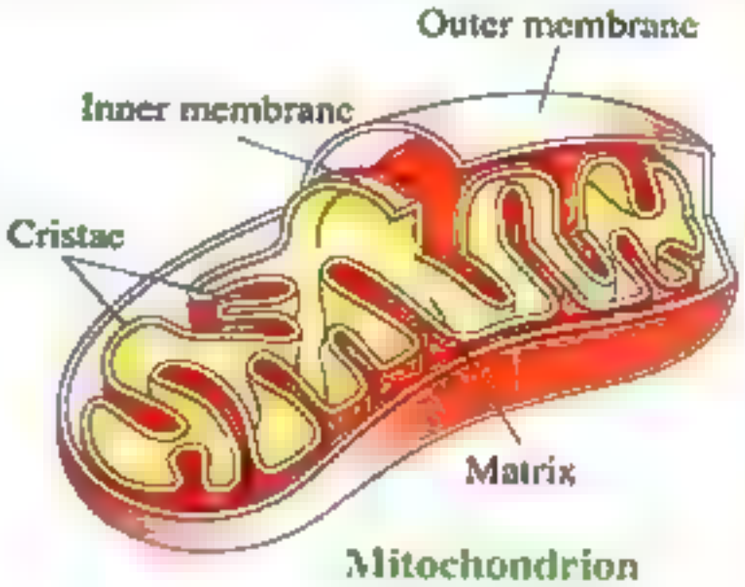
UNIT 2

4 Mitochondria

Description they are sac-like membranous organelles.

Structure

- Their wall consists of two membranes (outer and inner).
- A group of folds known as "cristae" are extended from the inner membrane into its matrix.



Mitochondrion

Functions

1. They are considered the main storehouse for the respiratory enzymes in the cell.
2. They are the storehouse for the substances that are necessary to store the energy resulted from the cellular respiration, as a result of nutrients oxidation (especially glucose), where this energy is stored in the form of ATP compounds (adenosine triphosphate) and the cell can extract this energy from these ATP compounds once more.
   So, the mitochondria represent the centres of the energy production in the cell **(the energy storehouse in the cell).**

Notes

(1) The function of cristae : they work on increasing the inner surface area on which the chemical reactions that produce energy take place.

(2) The number of mitochondria increases in muscular cells to increase the production of energy needed by the muscles.

5 Vacuoles

Description they are membranous sacs (similar to bubbles filled with a fluid).

Location

- In animal cells, they are small in size and large in number.
- In plant cells, they are gathered in one big vacuole or more.

Function - Storing water and nutrients.

Or

- Storing wastes of the cell, until it gets rid of such wastes.

Test yourself

Choose the correct answer :

(1) Which of the following is considered a currency of energy inside the living cell ? .....

ⓐ Glucose. ⓑ ATP

ⓒ Mitochondria. ⓓ Respiratory enzymes.

(2) Which of the following organelles occupies a large space in a cell of the bean plant root ? .....

ⓐ Nucleus. ⓑ Dictyosome. ⓒ Sap vacuole. ⓓ Mitochondria.

6 Plastids

Description they are various shaped membranous organelles.

Location they are present in plant cells only.

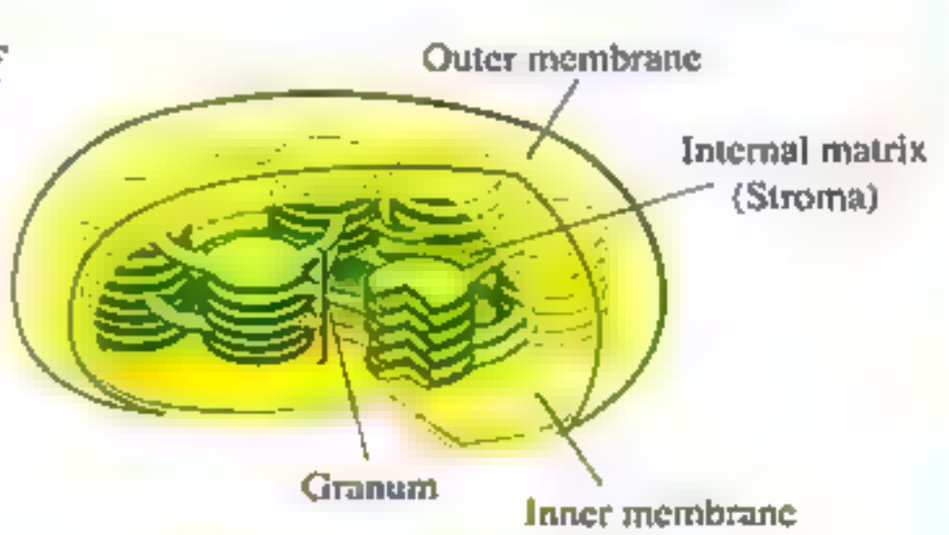
Types there are three types of plastids that differ from each other depending on the type of pigment that is present in each type of them, **which are :**

	① Leucoplasts (White or colourless plastids)	② Chromoplasts (Coloured plastids)	③ Chloroplasts (Green plastids)
Type of pigments	Don't contain any type of pigments.	Contain carotenoids pigments whose colours are varied between red, yellow and orange.	Contain the green chlorophyll pigment.
Function	They work as centres for storing the starch.	They give the plant or its parts that contain them its own characteristic colour.	Photosynthesis occurs in them, where chlorophyll pigment transforms the light energy of the Sun into chemical energy that is stored in the chemical bonds of glucose sugar.
Location	Present in the roots of sweet potatoes, stems of potatoes and internal leaves of cabbage.	Present extensively in the petals of flowers, fruits and roots of some plants such as rapeseed.	Present in the leaves and stems of green plants.

Structure of the chloroplast

It is composed of

1. A double envelope (membrane) which consists of outer and inner membranes.
2. A matrix called stroma.
3. Compact layers of disk-shaped structures known as thylakoids, where each group of them forms what is known as granum which is found inside the stroma.



Chloroplast

UNIT 2

Notes

- **Carotenoids (Carotenes) :** they are coloured pigments whose colours are varied between red, yellow and orange, where they are found in the chromoplasts of the plant cells.
- **Chromatin :** it is minute tangled filaments that are coiled around each other and found in the nucleus of animal and plant cells.

For illustration only

The colours of plant cell are related to the presence of chromoplasts as in the petals of flowers or to the presence of some coloured pigments in the cytoplasm as in beet and roselle.

Test yourself

Choose the correct answer :

(1) The plant cell extracts the stored energy in food through .....

ⓐ mitochondria. ⓑ chloroplasts. ⓒ leucoplasts. ⓓ chromoplasts.

(2) Chromatin is ....., while carotene is .....

ⓐ a pigment / a chromosome.

ⓑ a chromosome / a pigment.

ⓒ changed into chromosomes / a pigment.

ⓓ a pigment / changed into chromosomes.

Practical Activity 7 Comparison between the plant and animal cells

1. Used materials and tools :

- Glass slides.
- *Elodea* plant leaves.
- Forceps.
- Dropper.
- Water.
- Prepared slides of human cheek cells.
- A compound light microscope.

2. Procedures :

1 Use the forceps to separate a recent grown leaf from the tip of *Elodea* plant and put it on a drop of water that is placed on a glass slide, then cover it with a coverslip.

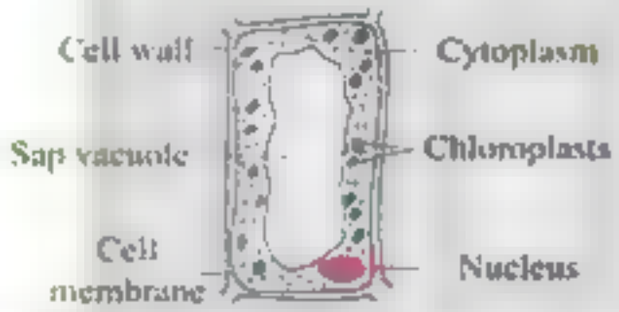
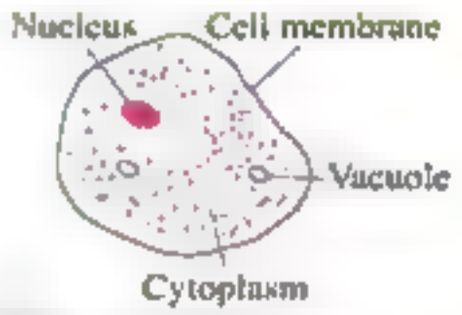
2 Examine the leaf by the low power objective lens (4x) of the light microscope, then by the median power objective lens (10x).

3 Sketch some cells that you have observed and name the cellular structures they contain.

4 Examine the specimen by the high power objective lens (40x) and name the structures that you have observed, then sketch these structures in the previously sketched cells.

5 Repeat the steps (2, 3 & 4) with the prepared slides of human cheek cells.

3. Diagrammatic sketch and observations :

	Plant cell (Cells of *Elodea* leaf)	Animal cell (Cells of cheek)
Diagrammatic sketch :		
Components that can be observed by a microscope :	• Cell wall. • Chloroplasts. • Big sap vacuole. • Cytoplasm. • Nucleus.	• Cell membrane. • Cytoplasm. • Small sap vacuole. • Nucleus.

4. Conclusion :

1 Plant and animal cells are similar in the presence of some cellular organelles and there are some other organelles that are characteristic for each one of them.

2 The structures that are restricted to the animal cell can't be seen by the light microscope, such as centrosome.

Notes

(1) The green colour of *Elodea* leaf is due to the presence of chloroplasts that contain green chlorophyll pigment.

(2) In order for the components of the specimens to be more clear, we can increase the contrasting power between the different parts of the specimen by adding stains or changing the light level (light intensity) of the microscope.

CHAPTER 2

QUESTIONS ON LESSON Two

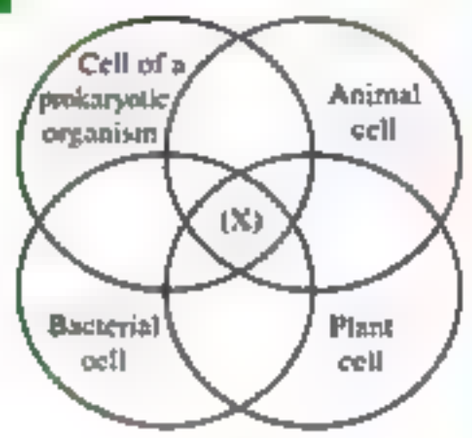
Continue : Cell Structure

Interactive test

The questions signed by ✍ measure the high levels of thinking.

First Multiple Choice Questions

1 The opposite diagram illustrates the components of four different cells, what is the component that is represented by the symbol (X) ? .....



ⓐ Cell membrane. ⓑ Cell wall.
ⓒ Chloroplast. ⓓ Centrosome.

2 ✍ Which of the following organelles is less affected by a lipid solvent ? .....

ⓐ Mitochondrion. ⓑ Ribosome. ⓒ Lysosome. ⓓ Plastid.

3 From the organelles which are not found in the green algae is(are) .....

ⓐ centrosome. ⓑ dictyosome. ⓒ mitochondria. ⓓ ribosomes.

4 The organelle that participates in increasing the number of cells is .....

ⓐ ribosome. ⓑ lysosome. ⓒ Golgi body. ⓓ centrosome.

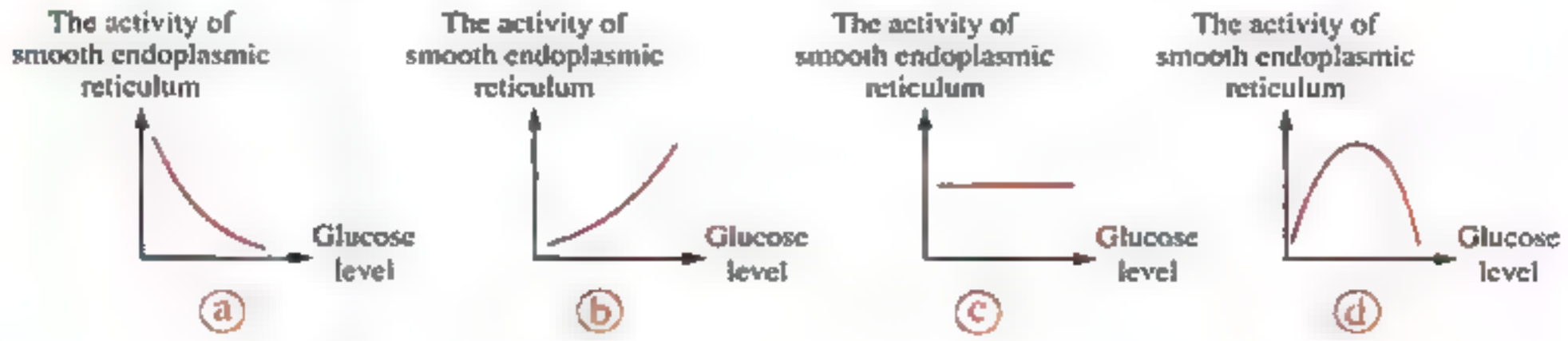
5 Which of the following plays an important role in the plant cell division ? .....

ⓐ Centrosome. ⓑ Cytoplasm. ⓒ Mitochondria. ⓓ Ribosome.

6 The opposite figure illustrates a unicellular living organism that lives in pond and fresh swamp water and moves by the structure (X) which is formed by the help of the .....

ⓐ ribosome. ⓑ lysosome.
ⓒ centrosome. ⓓ chromosome.

7 Which of the following graphs expresses the relation between the increase in the activity of smooth endoplasmic reticulum and the level of glucose in the hepatic cells ? .....



8 All the following are produced by the endoplasmic reticulum, except .....

ⓐ glycogen. ⓑ lipids. ⓒ proteins. ⓓ DNA

9 Which of the following functions in the cell is not affected by the absence of the endoplasmic reticulum ? .....

ⓐ The formation of cell secretions. ⓑ Protein synthesis.

ⓒ Energy production. ⓓ The connection between the cell parts.

10 The different substances move in certain passages inside the cell, which organelle(s) determine(s) these passages ? .....

ⓐ Golgi bodies. ⓑ Endoplasmic reticulum.

ⓒ Mitochondria. ⓓ Lysosomes.

11 Smooth endoplasmic reticulum is abundant in the cells of the .....

ⓐ liver and muscles. ⓑ stomach and liver.

ⓒ stomach and muscles. ⓓ brain and muscles.

12 Study the following diagram, then conclude :

The conversion of the harmful nitrogenous wastes into urea ← Cycle in the hepatic cells ← Organelle (X) → Cycle in the glandular cells → Secretion of steroid hormones

What is the organelle that is represented by the symbol (X) ? .....

ⓐ Smooth endoplasmic reticulum. ⓑ Lysosomes.

ⓒ Rough endoplasmic reticulum. ⓓ Mitochondria.

13 By using the opposite figure that represents a part of the living cell, answer :

(1) From the functions of part no. (1) is the .....

ⓐ synthesis of protein in the cell.

ⓑ energy production in the cell.

ⓒ synthesis of lipids in the cell.

ⓓ transfer of the genetic characters.

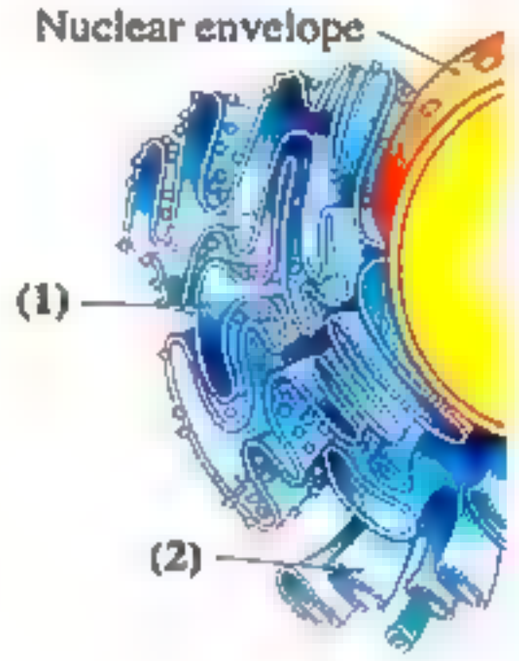
(2) From the functions of part no. (2) is the .....

ⓐ synthesis of protein in the cell.

ⓑ energy production in the cell.

ⓒ synthesis of lipids in the cell.

ⓓ transfer of the genetic characters.



UNIT 2

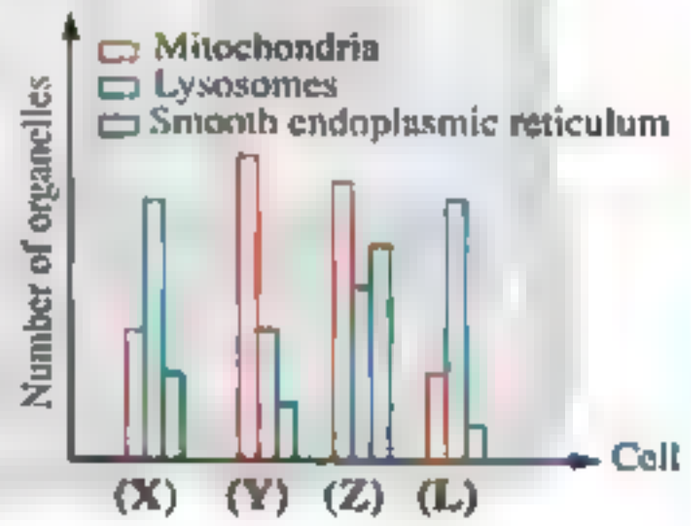
14 The correct pathway to secrete the pancreatic amylase enzyme is .....
(a) Golgi body ⟶ transporting vesicles ⟶ endoplasmic reticulum ⟶ lysosomes.
(b) transporting vesicles ⟶ Golgi body ⟶ endoplasmic reticulum ⟶ lysosomes.
(c) endoplasmic reticulum ⟶ transporting vesicles ⟶ Golgi body ⟶ lysosomes.
(d) endoplasmic reticulum ⟶ Golgi body ⟶ transporting vesicles ⟶ lysosomes.

15 The largest amount of ribosomes is present in the cells that produce .....
(a) lipids. (b) cellulose. (c) glycogen. (d) proteins.

16 Which of the following cells contains a larger amount of lysosomes ? .....
(a) Muscular cell. (b) Nerve cell. (c) White blood cell. (d) Red blood cell.

17 "Tay-Sach's disease is considered from the genetic diseases that are arisen from a disturbance in a somatic chromosome and causes the absence of the digestive enzyme for complex lipids which form the brain cells and spinal cord, leading to their accumulation and destroying these cells", which organelle is responsible for this case ? .....
(a) Endoplasmic reticulum. (b) Golgi apparatus.
(c) Lysosome. (d) Mitochondria.

18 A student examined four cells (X), (Y), (Z) and (L) by the electron microscope, then recorded the examination results in a table, and he represented these results in the opposite graph. Study it, then answer :



(1) The cell (X) may be a .....
(a) skin cell. (b) liver cell.
(c) muscular cell. (d) small intestine cell.

(2) The cell (Y) may be a .....
(a) skin cell. (b) muscular cell.
(c) cell of the thyroid gland. (d) small intestine cell.

(3) The cell (Z) may be a .....
(a) skin cell. (b) liver cell.
(c) brain cell. (d) small intestine cell.

(4) The cell (L) may be a .....
(a) red blood cell. (b) white blood cell.
(c) muscular cell. (d) skin cell.

19 The following equation illustrates a vital process occurred in each of the plant and animal cell, which of the following represents the symbols of the equation ? .....

$$(X) + (Y) \xrightarrow{(Z)} (L) + CO_2 + Water + (Z)$$

	(X)	(Y)	(Z)	(L)
(a)	O_2	ATP	Enzymes	Glucose
(b)	Glucose	O_2	Enzymes	ATP
(c)	Enzymes	O_2	ATP	Glucose
(d)	Glucose	Enzymes	O_2	ATP

20 To respire the living organisms aerobically, their cells must contain .....

(a) plasma membrane. (b) nucleus. (c) mitochondria. (d) ribosomes.

21 In the opposite figure, the arrows refer to .....

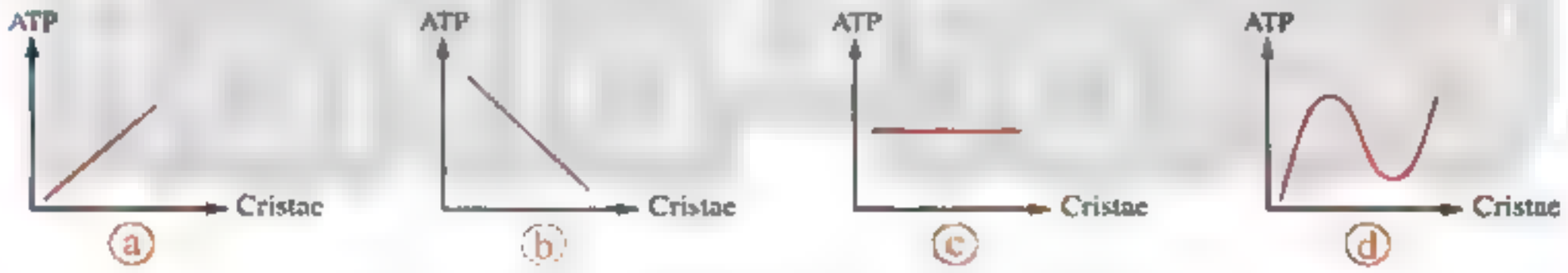
(a) the releasing of oxygen gas from the mitochondria during the cellular respiration process.

(b) the exit of ATP and glucose molecules from the mitochondria during the respiration process.

(c) the exit of glucose molecules from the mitochondria during the respiration process.

(d) the exit of ATP molecules from the mitochondria during the respiration process.

22 Which of the following graphs represents the relation between the surface area of the inner membrane of the mitochondria (cristae) and the amount of ATP molecules ? .....



23 The ribosomes that are found in the cytoplasm participate in each of the following, except .....

(a) the compensation of worn out tissues. (b) the formation of muscles.

(c) the getting rid of microbes. (d) the formation of cell membrane.

24 Which of the following contains the lysis enzymes ?.....

(a) Ribosomes. (b) Lysosomes. (c) Mitochondria. (d) Golgi bodies.

25 Which of the following organelles has the ability to produce molecules containing carbon, hydrogen, oxygen and nitrogen atoms ?.....

(a) Centrosome. (b) Chromosome. (c) Ribosome. (d) Mitochondria.

UNIT 2

26 Inside the living cell, the damaged mitochondria is surrounded by a membrane, forming a vesicle, which of the following do you expect to happen after adhering the lysosome with this vesicle ?.....

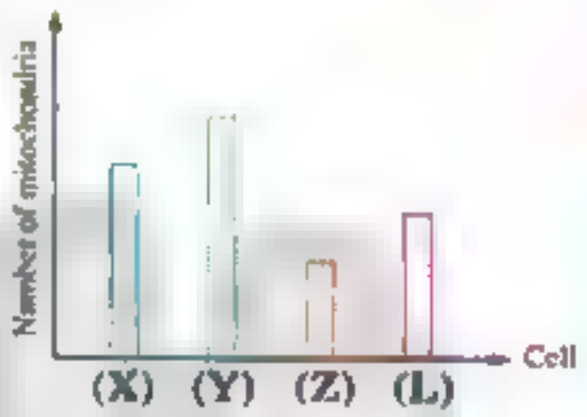
ⓐ The rate of ATP molecules production from mitochondria increases.
ⓑ The lysosomal enzymes repair the damaged mitochondria.
ⓒ The digestive enzymes decompose the damaged mitochondria.
ⓓ The damaged mitochondria is expelled outside the cell.

27 The cells that contain a large number of mitochondria need a large amount of .....

ⓐ ATP molecules and glucose molecules.
ⓑ ATP molecules and phosphate groups.
ⓒ ADP molecules and phosphate groups.
ⓓ ADP molecules and DNA molecules.

28 From the opposite graph, the most cell that produces ATP molecules is the cell .....

ⓐ (X).
ⓑ (Y).
ⓒ (Z).
ⓓ (L).



29 All the following are from the main components of any living cell, except the .....

ⓐ nucleus.
ⓑ cell wall.
ⓒ plasma membrane.
ⓓ ribosomes.

30 "If you know that the changes occurred in the chloroplasts is opposite to what happens in the mitochondria", from the previous statement, it can be concluded that ..... is occurred.

ⓐ catabolism in plastid
ⓑ catabolism in mitochondria
ⓒ anabolism in mitochondria
ⓓ cellular respiration in plastid

31 By using the data in the following table, which of the following illustrates the characteristics of the bread mould fungus ? .....

	Cell wall	Centrosome	Plastids	Lysosomes
ⓐ	✓	✓	✓	✘
ⓑ	✘	✘	✘	✓
ⓒ	✘	✓	✘	✓
ⓓ	✓	✘	✘	✓

Present	✓
Absent	✘

32 Which of the following structures are present in each of the plant and animal cell ? .....

ⓐ Plastids.
ⓑ Cell wall.
ⓒ Two centrioles.
ⓓ Cytoplasm microtubules.

33 The opposite table illustrates the sites of DNA in some plant cell structures, depending on the data that are found in the table only, which of the following statements is correct ? .....

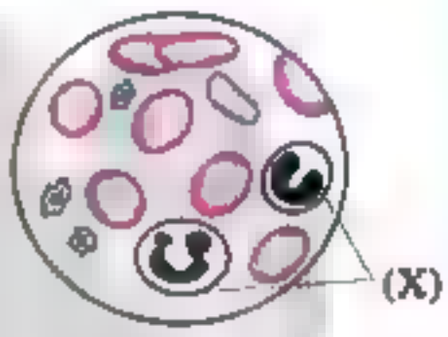
Structure	DNA
Plasma membrane	Absent
Cell wall	Absent
Nucleus	Present
Mitochondria	Present

(a) DNA is present in the cytoplasm and outside the plasma membrane.
(b) DNA is present inside and outside the nucleus.
(c) DNA is present inside the nucleus only.
(d) DNA is present inside the organelles that produce energy only.

34 The part if it is removed, the cell is still living, but it becomes exposing to pathogens, is the .....

(a) nucleus. (b) smooth endoplasmic reticulum.
(c) lysosome. (d) mitochondria.

35 The opposite figure illustrates a human blood sample under the light microscope, the most organelles that are found in the cells (X) are .....



(a) mitochondria. (b) ribosomes.
(c) lysosomes. (d) two centrioles.

36 From the organelles that are found more in the cells of thyroid gland is(are) .....

(a) lysosomes. (b) centrosome.
(c) Golgi body. (d) smooth endoplasmic reticulum.

37 All the following occur when the Golgi bodies are absent from the cell, except .....

(a) the accumulation of senile organelles in the cell.
(b) the stop of the transfer of substances from a place to another in the cell.
(c) non-forming the lysosomes inside the cell.
(d) the exposure of the cell to infect with microbes.

38 The cells producing enzymes contain large amounts of each of the following, except the .....

(a) ribosomes. (b) nucleoli. (c) Golgi bodies. (d) centrosome.

39 Lysosomes contain .....

(a) respiratory enzymes. (b) cell secretions.
(c) digestive enzymes. (d) (b) and (c) together.

UNIT 2

40 Lysosomal membranes contain each of the following, except .....
(a) simple lipids. (b) lipid derivatives. (c) complex lipids. (d) proteins.

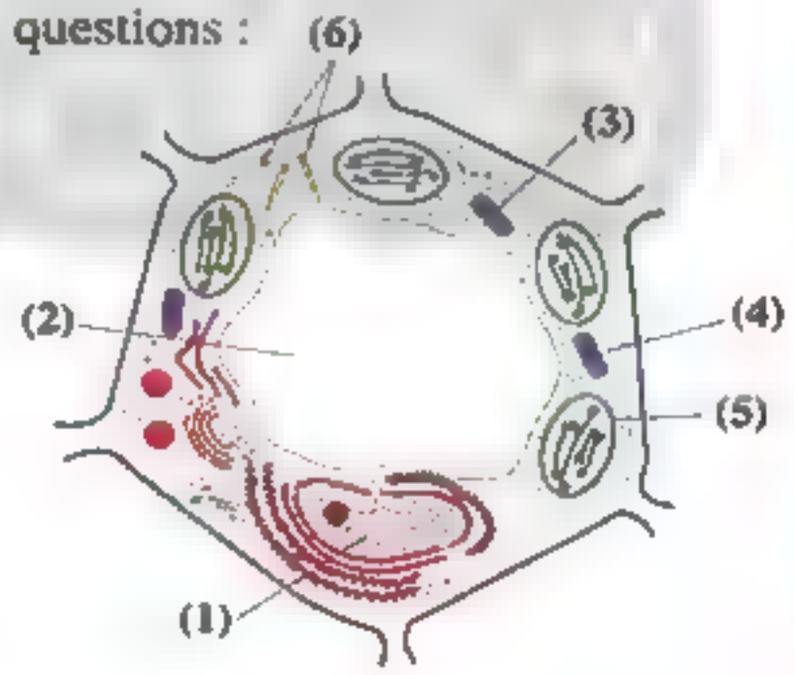
41 The cholesterol that is needed to build the plasma membranes is formed in the liver cells, because they contain .....
(a) lysosomes. (b) smooth endoplasmic reticulum.
(c) ribosomes. (d) Golgi bodies.

42 The digestive enzymes that are secreted from the small intestine are produced by .....
(a) the ribosomes present on the endoplasmic reticulum.
(b) the ribosomes present in the cytoplasm.
(c) the ribosomes present on the endoplasmic reticulum and in the cytoplasm.
(d) the lysosomes.

43 The green plastids in the plant cell do the following functions, except .....
(a) performing the photosynthesis.
(b) converting the energy from a form to another.
(c) the oxidation of glucose.
(d) storing the energy in the chemical bonds of the grape sugar.

44 Which of the following contain carotene pigment in large amounts ? .....
(a) mallow plant leaves. (b) orange fruits.
(c) cabbage leaves. (d) potato tubers.

45 Examine the opposite figure, then answer the following questions :



(1) The part in which the conversion of energy from a form to another occurs, is no. .....
(a) (1). (b) (2).
(c) (5). (d) (6).

(2) The part that contains DNA is no. .....
(a) (1). (b) (2).
(c) (4). (d) (6).

(3) The parts that contain RNA are no. .....
(a) (1) and (4). (b) (2) and (4). (c) (1) and (5). (d) (2) and (5).

(4) The part(s) that characterize(s) the green plant cells is(are) no. .....
(a) (1) and (4). (b) (2) and (5). (c) (5) only. (d) (4) only.

(5) The part in which the catabolism process of glucose molecules occurs, is no. .....
(a) (2). (b) (3). (c) (4). (d) (5).

Second Miscellaneous Questions

Explain :
- Ribosomes participate in the growth of the living organisms.
- Ribosomes play an important role in the cell.

2 What are the polymers that their presence is affected by the absence of ribosomes in the cell ?

3 "The animal cell loses its ability to divide, in case of the absence of lysosomes".
How far this statement is correct ? With explanation.

4 "The number of microtubules in the centrosome is 27 tubules".
How far this statement is correct ? With explanation.

Compare between : centrosome and centromere, "**in terms of :** location – function".

6 "The vacuoles are not found in the cells of a plant leaf".
How far this statement is correct ? With explanation.

"Endoplasmic reticulum participates in the synthesis of fatty acids in the cell".
How far this statement is correct ? With explanation.

8 Give reason for : the presence of rough endoplasmic reticulum increases in the stomach lining cells and endocrine gland's cells.

9 Liver reduces the sugar level in blood and decreases the toxins in the body.
Explain this.

10 "All the hormones are produced from the secretions of endoplasmic reticulum".
How far this statement is correct ? With explanation.

11 Mention the organelles that are found in abundance in :

(1) Stomach lining cells.
(2) Thyroid gland's cells.
(3) Hepatic (liver) cells.
(4) Cells of sweet potato roots.
(5) Potato tubers.
(6) Internal leaves of cabbage.
(7) Petals of violet flower.
(8) Rapeseed roots.
(9) Fresh tomatoes.
(10) White blood cells.

12 Give reason for : Golgi bodies are abundant in the glandular cells.

13 Explain : there is a relationship between the endoplasmic reticulum and Golgi bodies.

14 What happens in case of : the lack of Golgi bodies from the glandular cells ?

UNIT 2

15 What is the organelle that has an immunization function inside the cell ? With explanation.

16 The following cell organelles play a role in the production of enzymes :
(Lysosomes – Ribosomes – Golgi bodies – Endoplasmic reticulum)
Conclude the correct arrangement of these organelles to produce the enzymes.

17 Insulin hormone is considered a protein that is produced by beta cells in pancreas, follow by arrows only the pathway of the insulin hormone from its production inside the cells till its arrival to the target cell.

18 What happens when : the white blood cells engulf a certain microbe ?

19 What happens in case of : the lysis of the lysosomes' walls inside the cell ?

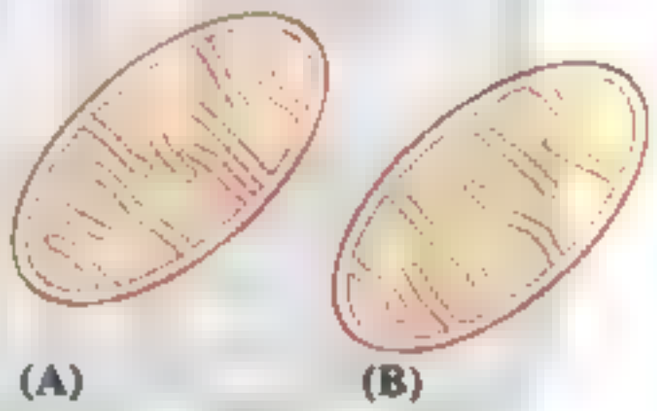
20 What happens in case of : the non-separation of lysosomes from Golgi bodies ?

21 What happens in case of : the absence of lysosomes from the white blood cells ?

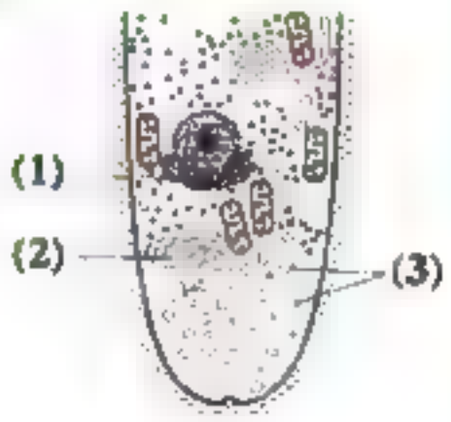
22 Explain : the proportion of Golgi bodies differs in the cells of thyroid gland from the skin cells.

23 What happens if : the mitochondrion is removed from the cell ?

24 The opposite figures represent two mitochondria :
(a) In which type of cells may this organelle be found in abundance ?
(b) In which (A) or (B) the energy production is more ? And why ?



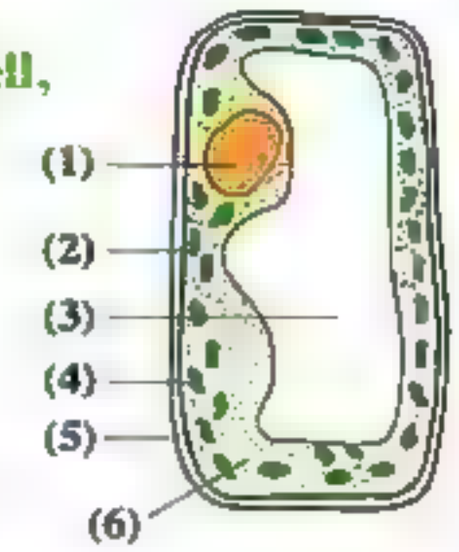
25 The following figure illustrates a magnified part of a fungal filament that lives as a saprophyte, where it gets its food from the lysis of dead organisms through secreting a group of digestive enzymes.
Examine this figure, then answer the following questions :
(a) Write down the labels no. (1), (2) & (3).
(b) The structures no. (1), (2) and (3) participate in the production and secretion of the digestive enzymes inside the fungal cell. Follow by arrows only the pathway of these enzymes, till their exit.



26 "Leucoplasts form the glucose sugar".
How far this statement is correct ? With explanation.

27 **Explain :** the number of adenosine triphosphate compounds differs in the muscular cell from the skin cell.

28 **The opposite figure illustrates a diagrammatic figure for a plant cell, examine it, then write the number and the name of the part that :**



(a) Regulates the passage of substances from and to the cell.

(b) Performs the photosynthesis process.

(c) Stores the wastes of the cell.

(d) Contains the information needed to control the shape of the cell.

29 **Write the similarity and the difference between :**

(1) Sweet potato root cells and apple fruit cells.

(2) A cell of mallow plant leaf and a cell of rapeseed root.

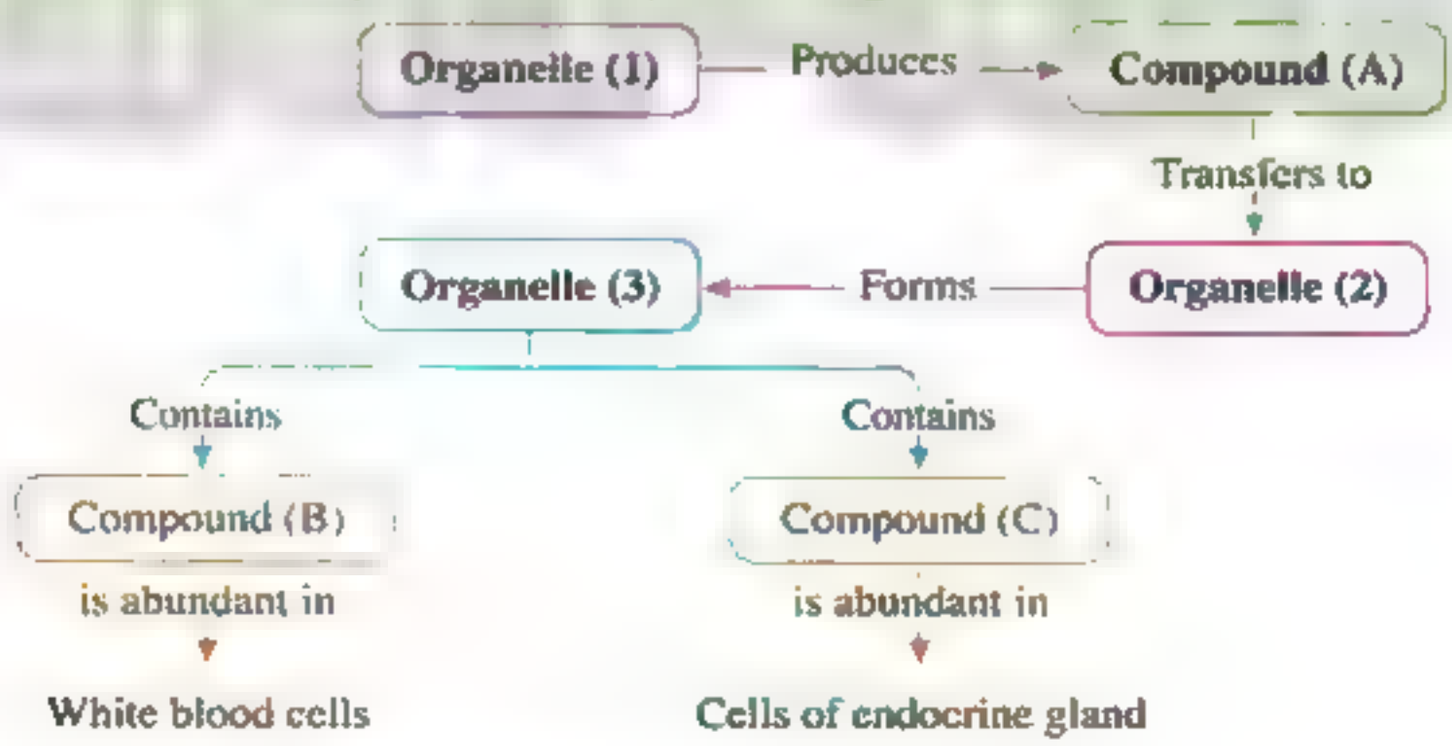
30 **The following table illustrates some structures of two cells (1) and (2) :**

The structure	Cell (1)	Cell (2)
Cell wall	Present	Absent
Cell membrane	Present	Present
Chloroplast	Present	Absent
Mitochondria	Present	Present

(a) **Determine** the type of each of the two cells (1) and (2), **then explain.**

(b) If the cell (2) contains a protein attached to iron element, **determine the name of this cell.**

31 **The following diagram illustrates the binding of some organelles with each other to form a number of compounds, study this diagram, then answer :**



(a) **Conclude** the name of the organelles from (1) : (3).

(b) **Where** are the organelles (1) and (2) found in abundance ?

(c) **What** may the compounds (A), (B) and (C) represent ?

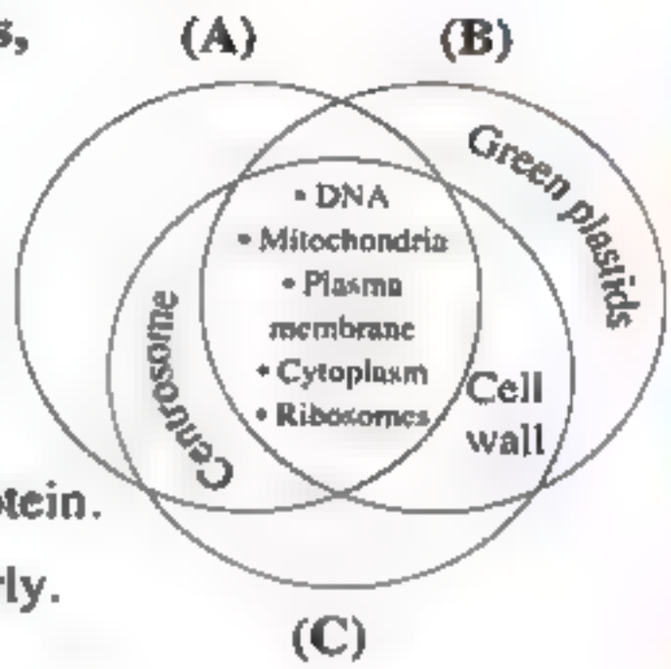
Model Exam on

Chapter 2

Cell Ultrastructure

Choose the correct answer (1 : 10) :

The opposite figure represents three types of living cells, examine it, then answer :



1 The cell (C) represents a(an) ..... cell.

(a) animal (b) plant

(c) fungus (d) alga

2 The cell (A) can't .....

(a) produce energy. (b) synthesize protein.

(c) perform the photosynthesis process. (d) divide cellularly.

3 The cell (B) may be a cell of ..... cells.

(a) coloured flower petal (b) sweet potato plant root

(c) rapeseed plant root (d) bean plant leaf

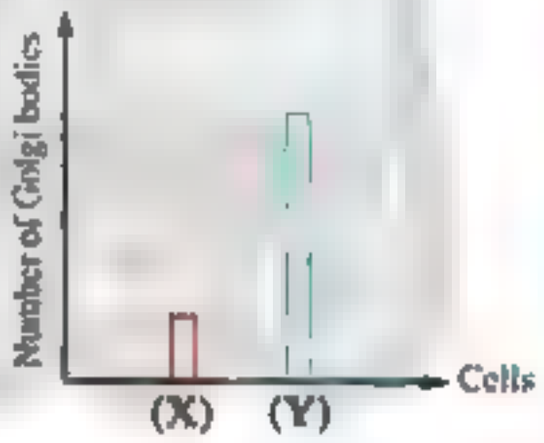
4 The following graph represents the relationship between the number of Golgi bodies in two cells (X) and (Y) in human body, the cell (X) may differ from the cell (Y) in .....

(a) the structure of the plasma membrane.

(b) the presence of nucleus.

(c) the presence of centrosome.

(d) the number of mitochondria.



5 Estrogen hormone is from the steroids and it is synthesized by the .....

(a) mitochondria. (b) smooth endoplasmic reticulum.

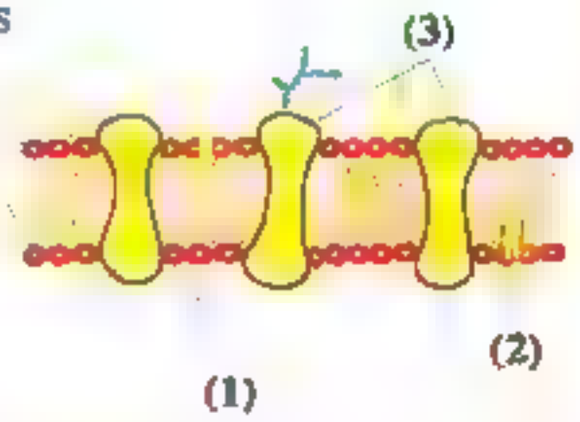
(c) rough endoplasmic reticulum. (d) ribosomes.

6 If you know that the human body contains the spleen that is responsible for getting rid of the senescent red blood cells. Which organelle do you expect to be found in abundance inside its cells ? .....

(a) Lysosome. (b) Smooth endoplasmic reticulum.

(c) Mitochondria. (d) Centrosome.

7 In the opposite figure, which of the following structures supplies a cell with a support that keeps its shape ? .....



ⓐ (1). ⓑ (2).

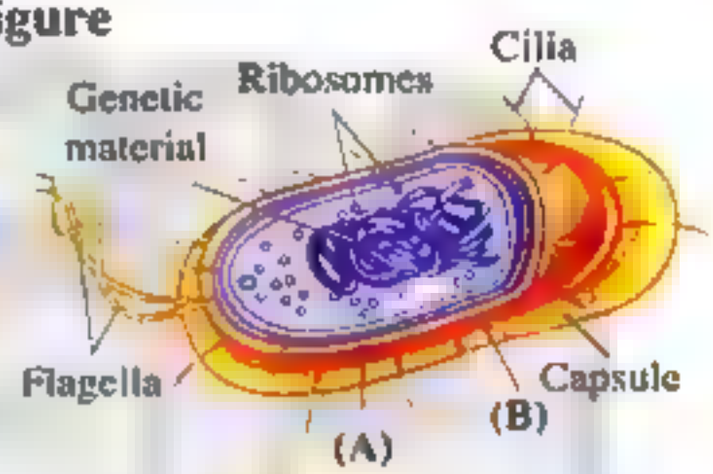
ⓒ (3). ⓓ (4).

8 Which of the following organelles is least affected by non-polar solvents ? .....

ⓐ Lysosomes. ⓑ Ribosomes.

ⓒ Mitochondria. ⓓ Golgi bodies.

The following figure represents a bacterial cell that lives in liquid media as water and milk, using the flagella illustrated in the figure for the movement, examine it, then answer :



9 The structure (A) .....

ⓐ acts on supporting the bacterial cell.

ⓑ allows the passage of water and dissolved substances through it easily.

ⓒ regulates the passage of the substances from and to the cell.

ⓓ is found in the bacterial and plant cells only.

10 The structure (B) .....

ⓐ acts on supporting the bacterial cell.

ⓑ allows the passage of water and doesn't allow the passage of dissolved substances through it.

ⓒ regulates the passage of substances from and to the cell.

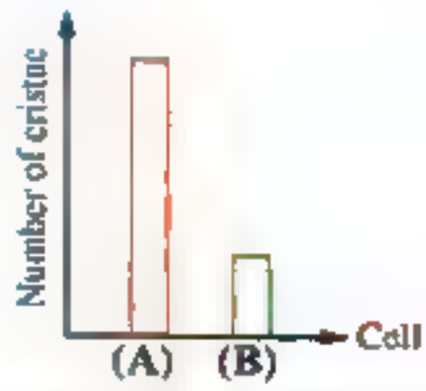
ⓓ is present in all the living cells.

Answer the following questions (11 : 17) :

11 What happens if : the vacuoles inside plant cells are absent ?

UNIT 2

12 The opposite graph illustrates two cells (A) and (B), which of these cells has the ability to produce a larger amount of energy ?
Explain your answer.



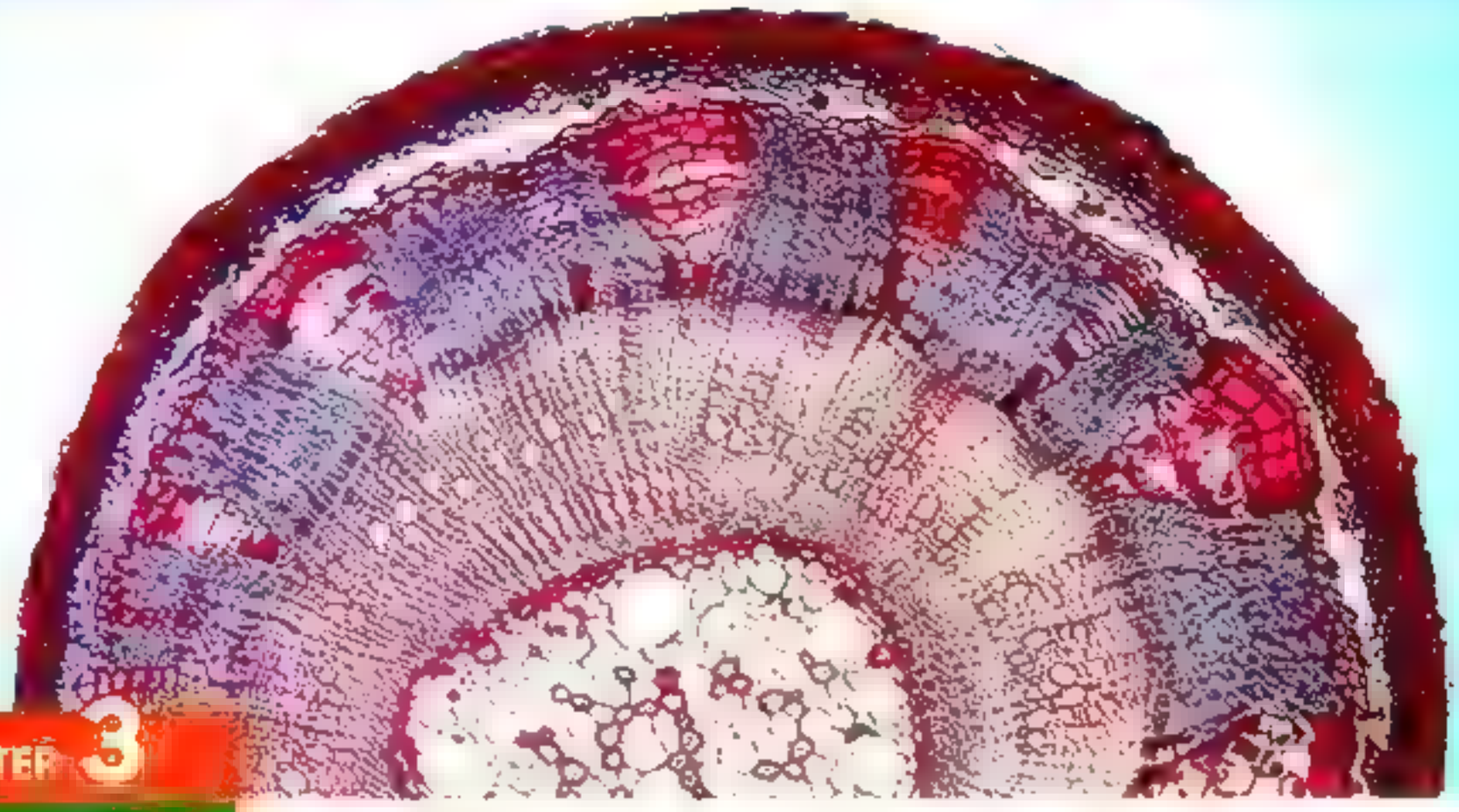
13 Chromosome is a cellular structure that consists of two types of biological polymers.
Explain this.

14 Is it possible that the plasma membrane consists of simple lipids and protein instead of phospholipids and protein ? **What happens in this case ?**

15 The opposite figure illustrates white blood cells (A) and (B). **Which of the two cells may be found in a person suffered from a certain inflammation ?**
Explain your answer.

16 Cytoplasm replaces the function of an organelle of the cell in some living organisms.
Explain this.

17 "All the cells are surrounded by structures consisting of the same type of polymers".
How far this statement is correct ? With explanation.



CHAPTER 3

LESSON ONE

- **Organization of Living Organisms.**
- **Differentiation of Cells and Diversity of Plant Tissues.**

Organization of living organisms

- If we took the human as an example for the multicellular living organisms to identify his body building, we will find that :

Human body

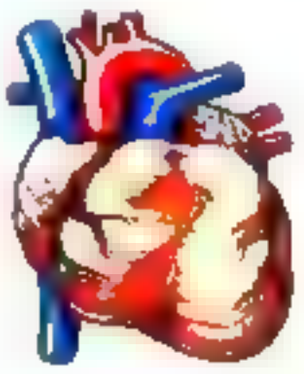
- It is composed of many systems which integrate and organize together, forming the whole body.
- For example: circulatory, skeletal, muscular, nervous, digestive, respiratory, excretory and reproductive systems.

System

- It is composed of a group of organs that work together.
- For example : the circulatory system which consists of the heart, blood and blood vessels.

Organ

- It is composed of a group of tissues that work together in an organized form to perform certain functions.
- For example : the heart which consists of a cardiac muscular tissue, nervous tissue and connective tissue, where all of them collaborate together to pump the blood from the heart to all the body parts.



UNIT 2

Tissue

- It is composed of a group of cells that are specialized in their work. So, it has more than one type.
- For example : the muscular tissue of the heart wall which consists of a group of cardiac muscular cells.

- **The tissue may be :**
  - **Simple tissue :** consists of cells that are symmetrical with each other in the structure, shape and function. (i.e. It consists of one type of cells).
  - **Compound tissue :** consists of more than one type of cells.
- Tissues vary according to the difference of the living organisms, the vital activities and functions that are performed by the tissues.

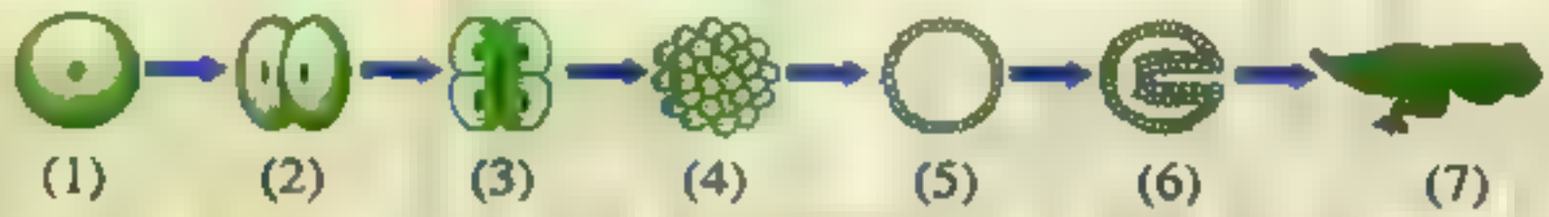
- **From the previous, we conclude that :**

Human body → (Consists of) Group of systems → (Each consists of) Group of organs → (Each consists of) Group of tissues → (Each consists of) Group of cells

Test yourself

Choose the correct answer :

The following figure illustrates the development stages of a toad, which level of the development represents the stages no. (1) and no. (4) respectively ? .....



(1) (2) (3) (4) (5) (6) (7)

ⓐ Cell and organ. ⓑ Cell and tissue. ⓒ Tissue and cell. ⓓ Organ and cell.

- **In the following, we will study the most common plant and animal tissues :**

Plant tissues

- **Plant tissues can be differentiated into simple and compound tissues, as follows :**

1. **Simple tissues** — such as → Parenchyma tissue, Collenchyma tissue, Sclerenchyma tissue
2. **Compound (Complex) tissues** — such as → Conductive (Vascular) tissues → Xylem tissue, Phloem tissue

1 Simple tissues

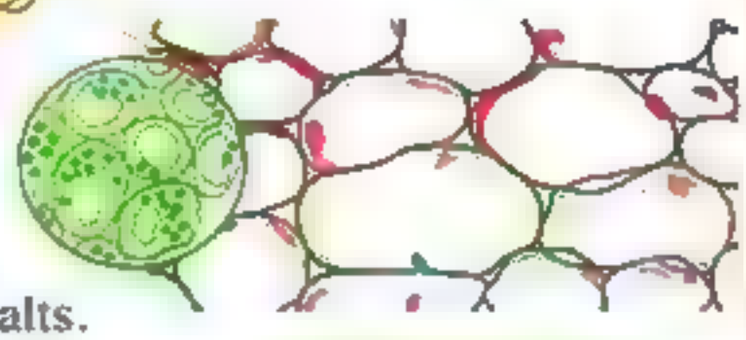
• **There are three types of simple tissues, which are :**

1 Parenchyma tissue :

• **Description : a living tissue whose cells are characterized by the following :**

- Oval or round-shaped.
- Their walls are thin and elastic.
- There are spaces (intercellular spaces) among them for aeration.
- Contain chloroplasts or chromoplasts or leucoplasts.
- Contain one big vacuole or more that is filled with water and mineral salts.

Potato tuber



Parenchyma tissue

• **Site : as in potato tuber.**

• **Functions :**

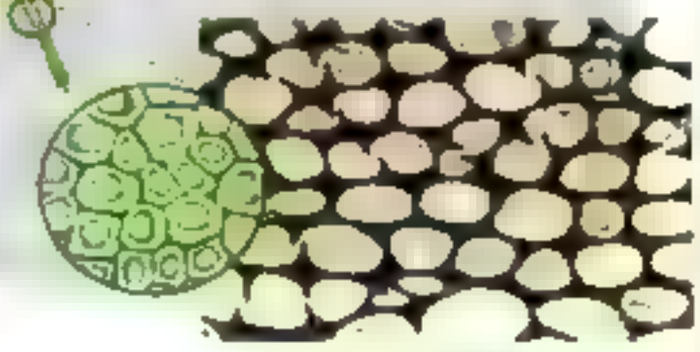
- Perform the photosynthesis process.
- Store nutrients. such as starch.
- Responsible for aeration.

2 Collenchyma tissue (Soft tissue) :

• **Description : a living tissue whose cells are characterized by the following :**

- Somewhat rectangular shape.
- Their walls are irregularly thickened by cellulose.

Parsely stem



Collenchyma tissue

• **Site : as in parsley stem.**

• **Function :**

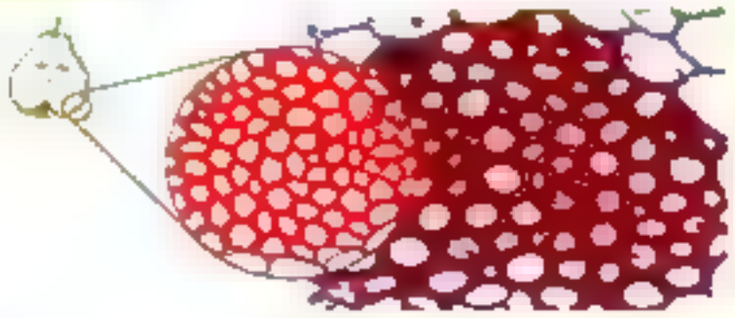
Supporting the plant by acquiring it with the suitable elasticity.

3 Sclerenchyma tissue (Solid tissue) :

• **Description : a non-living tissue whose cells are characterized by :**

Their walls are thickened by lignin substance. in addition to cellulose.

Pear fruit



Sclerenchyma tissue

• **Site : as in pear fruit.**

• **Function :**

Strengthening and supporting the plant by acquiring it with the hardness and elasticity.

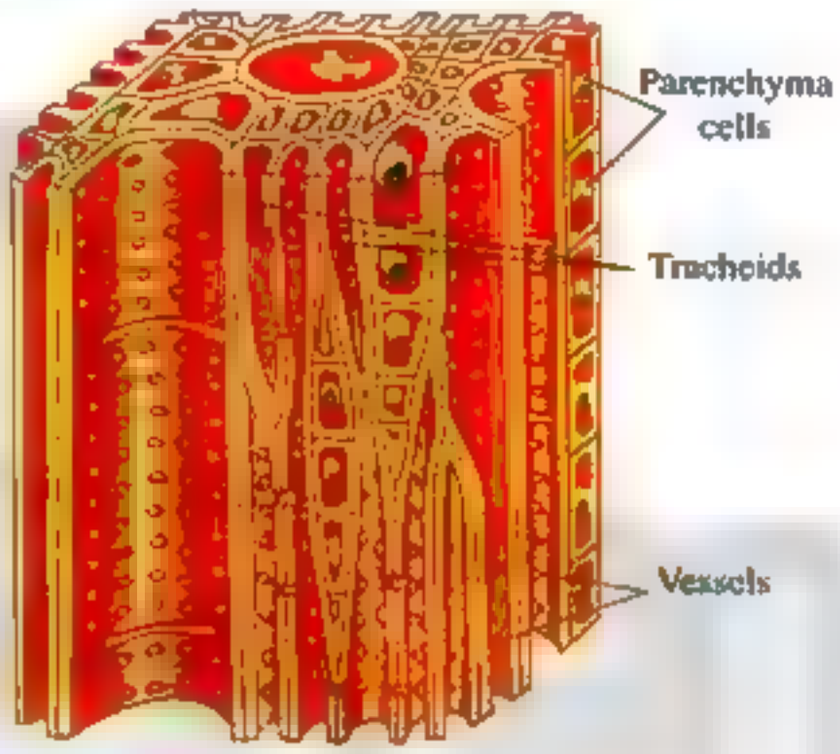
UNIT 2

2 Compound (Complex) tissues

- From the examples of the plant compound tissues is the conductive or vascular tissues which are divided into two types whose function is transportation. They are **xylem** and **phloem.**

- **Structure :**

Consists of vessels – tracheids – parenchyma cells.



Xylem tissue

Q

Xylem tissue :

EKB

(1) Vessels :

They are tubes, each of them is made up of a vertical row of cells, where :

- The protoplasm and transverse walls were disappeared from them.
- **Lignin** substance was deposited on the inner surface of their walls from the inside. So, these cells are converted into long wide vessels through them water and salts are transported and their length ranges from few centimeters to several meters as in high trees.

(2) Tracheids :

Each of them is composed of one cell, where :

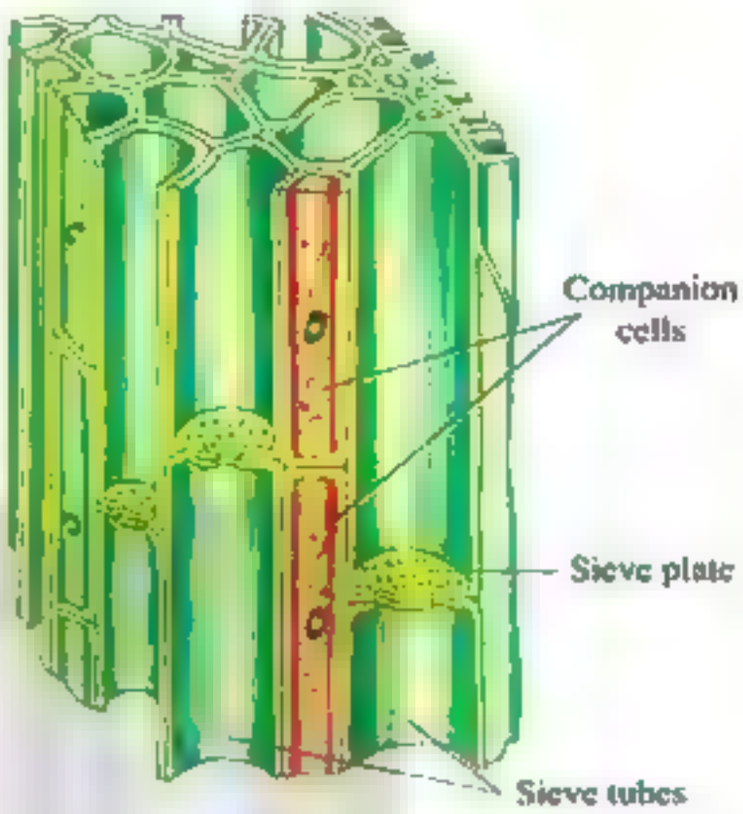
- The protoplasm disappeared from it.
- Their walls get lignified.

- **Functions :**

- Transporting water and salts from the root to the stem, then to the leaves.
- Supporting the plant.

• Structure :

Consists of seive tubes – companion cells.



Phloem tissue

② Phloem tissue :

EKB

(1) Sieve tubes :

They originate from a vertically compacted cells above each other, **where :**

- Their nuclei disappeared.
- Their separating walls became perforated and called **sieve plates** to allow the passage of cytoplasm through them in the form of cytoplasmic threads.

(2) Companion cells :

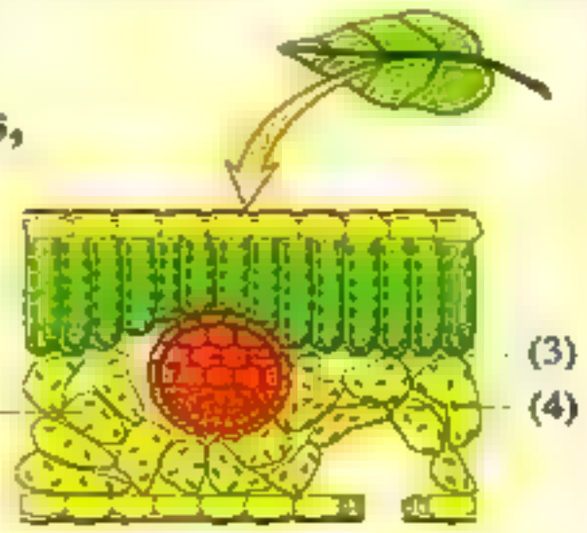
They are living cells that are located adjacent to the sieve tubes, to provide them with the required energy to perform their function.

• Function :

Transporting the nutrients that are resulted during photosynthesis from the leaves to the other plant parts.

② Test yourself

The opposite figure represents a group of tissues in a plant leaf, knowing that the green points represent the chloroplasts, examine this figure, then choose the correct answer :



(1) The tissue that is responsible for aeration is .....

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

(2) The tissues that perform the photosynthesis process are .....

ⓐ (1) and (2). ⓑ (2) and (3).

ⓒ (3) and (1). ⓓ (4) and (2).

CHAPTER 3

QUESTIONS ON LESSON One

- Organization of Living Organisms.
- Differentiation of Cells and Diversity of Plant Tissues.

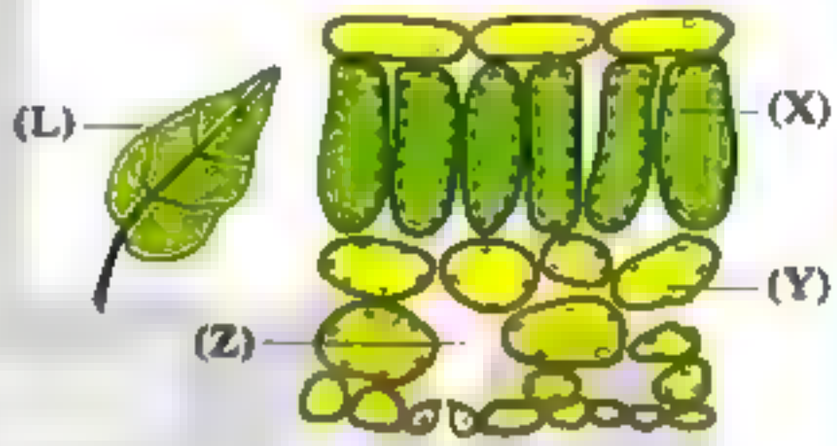
The questions signed by HOT measure the high levels of thinking.

Interactive test

First Multiple Choice Questions

1 HOT The least level of the organization in the nervous system is illustrated in the .....
(a) nervous tissue. (b) brain. (c) nerve cell. (d) mitochondria.

2 The following figure illustrates a leaf of the bean plant and a transverse section in it, study it, then answer :



(1) Which of the following represent a cell and an organ respectively ? .....
(a) (X) and (Z).
(b) (Y) and (L).
(c) (Z) and (L).
(d) (L) and (X).

(2) Which of the following represents the function of structure (Y) ? .....
(a) Performing the photosynthesis process. (b) Aeration.
(c) Supporting. (d) (a) and (b) together.

(3) Glucose molecules are formed in structure(s) .....
(a) (X). (b) (Y). (c) (X) and (Y). (d) (Y) and (Z).

3 From the tissues that work on supporting the plant are ..... tissues.
(a) collenchyma and sclerenchyma (b) parenchyma and sclerenchyma
(c) parenchyma and collenchyma (d) parenchyma and xylem

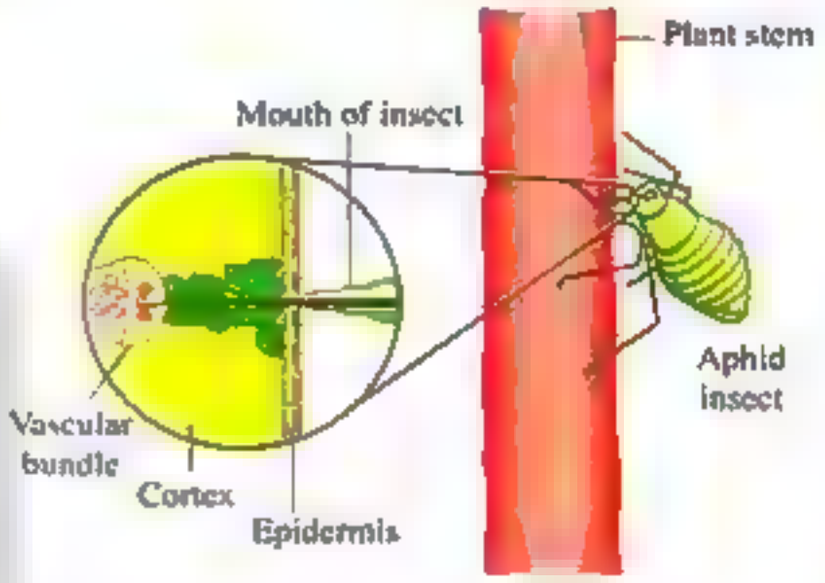
4 HOT If you know that the fibers of linen are characterized by their ability to bear the tensile, which of the following tissues do you believe that they are formed of ? .....
(a) Parenchyma tissue. (b) Sclerenchyma tissue.
(c) Xylem tissue. (d) Phloem tissue.

5 Which of the following contains a nucleus ? .....
(a) Vessels. (b) Tracheids. (c) Companion cells. (d) Sieve tubes.

6 HOT The product of the photosynthesis process in the plant transfers through .....
(a) tracheids. (b) vessels. (c) parenchyma cells. (d) sieve tubes.

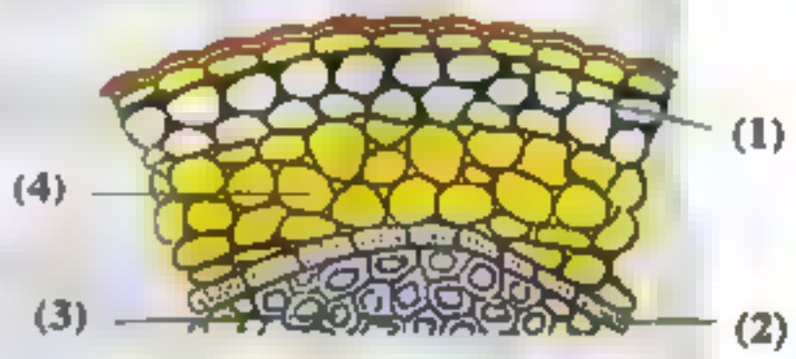
7 Xylem is similar to phloem in .....
ⓐ the direction of the movement of substances inside it.
ⓑ the structure.
ⓒ the type of thickening.
ⓓ the type of tissue.

8 The opposite figure illustrates an experiment that was carried out by a researcher, where he used an insect feeding on the plant sap by its piercing mouthparts in the tissues of a plant stem, and he sectioned the region in the plant stem to identify the region where the proboscis of the insect was inserted and analyzed the liquid that was present in this tube. He found this sample consisting of sugars, from the previous we conclude that the region where the proboscis of the insect was inserted is .....



ⓐ tracheids. ⓑ xylem vessels. ⓒ sieve tubes. ⓓ parenchyma cells.

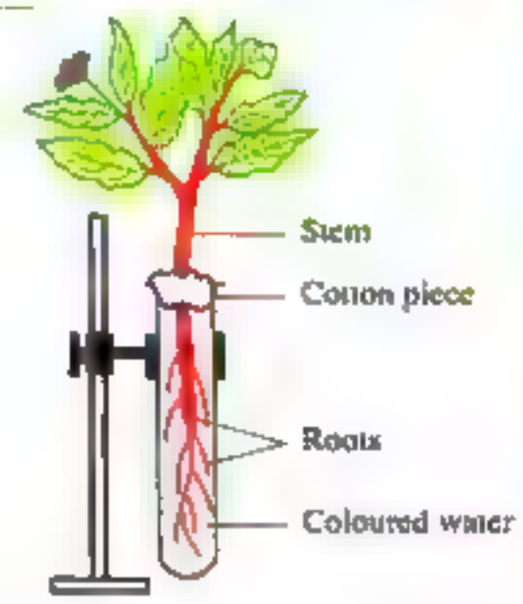
9 The opposite figure represents a group of plant tissues in a stem of the higher plant. study it, then answer :



(1) The tissue that is responsible for the aeration is no. .....
ⓐ (1). ⓑ (2).
ⓒ (3). ⓓ (4).

(2) Tissue (1) may be found in .....
ⓐ potato tuber. ⓑ pear fruit.
ⓒ parsley stems. ⓓ no correct answer.

10 A researcher put a plant in a test tube containing coloured water that stains the cells and left the tube for 24 hours as shown in figure, then he made a transverse section in the stem of this plant and examined it under the light microscope, he observed that the .....



ⓐ sieve tubes are coloured by the same colour of water.
ⓑ xylem vessels are coloured by the same colour of water.
ⓒ sieve tubes and xylem vessels are coloured by the same colour of water.
ⓓ companion cells of the sieve tubes are coloured by the same colour of water.

UNIT 2

11 "Phloem tissue contains sieve tubes and companion cells", "The sieve tubes provide the companion cells with the energy needed to transfer the product of the photosynthesis from the leaves to all the plant parts", ...

(a) the two statements are correct.
(b) the first statement is correct and the second statement is wrong.
(c) the first statement is wrong and the second statement is correct.
(d) the two statements are wrong.

12 "Parenchyma tissue performs the photosynthesis process to form the glucose", "The plant stores the glucose temporarily in the plastids found in it", ...

(a) the two statements are correct and related.
(b) the two statements are correct and not related.
(c) the first statement is correct and the second statement is wrong.
(d) the first statement is wrong and the second statement is correct.

13 Which of the following plant cells can't transcribe RNA ? .....

(a) Xylem vessels only.
(b) Companion cells only.
(c) Sieve tubes only.
(d) Xylem vessels and sieve tubes.

14 The inability of the sieve tubes to produce energy, due to the absence of the .....

(a) nucleus. (b) cytoplasm. (c) cell membrane. (d) mitochondria.

15 Which of the following are found in the structure of the conductive vascular tissue for the soil salts ? .....

(a) Sieve tubes only.
(b) Tracheids only.
(c) Companion cells only.
(d) Sieve tubes and companion cells.

16 Which of the following is from the plant tissues that perform most of metabolic processes ? .....

(a) Parenchyma tissue.
(b) Xylem tissue.
(c) Sclerenchyma tissue.
(d) Phloem tissue.

17 The plant tissue whose cells are thickened by the cellulose substance only and it supports the growing plant parts, is the .....

(a) parenchyma tissue.
(b) collenchyma tissue.
(c) xylem vessels.
(d) sclerenchyma tissue.

Second Miscellaneous Questions

1 "Mature tomato fruits perform the photosynthesis process".
How far this statement is correct ? With explanation.

2 Give reason for : sweet potato roots are able to store the nutrients, such as the starch.

3 Give an example for each of the following :

(1) A plant tissue consists of symmetrical cells that don't have a nucleus.

(2) A plant tissue consists of different living and non-living cells.

4 What is the tissue that is found in :

(1) Beets roots. (2) Pepper fruits. (3) Coriander stems.

5 What happens if : the plant is devoid of the parenchyma tissue ?

6 What happens if : the plant is devoid of the sclerenchyma tissue ?

7 What happens in case of : the absence of intercellular spaces from the parenchyma tissue ?

8 The following figures illustrate three different plant parts, examine them, then **write the number of the plant that represents each statement of the following :**

(1)

(2)

(3)

(a) It is characterized by the presence of cells that store the complex sugars.

(b) It is characterized by the presence of thickened cells with cellulose only for supporting.

(c) It is characterized by the presence of cells that store the simple sugars.

(d) It is characterized by the presence of sclerenchyma cells.

9 "Companion cells contain mitochondria".
How far this statement is correct ? With explanation.

10 Explain : xylem works as a supporting tissue for the plant.

11 Explain : xylem tissue is necessary for the plant life.

12 What happens if :

- The lignin is deposited on the sieve plates of the phloem tissue.
- The pores of the sieve plates in a phloem tissue of a certain plant are blocked.

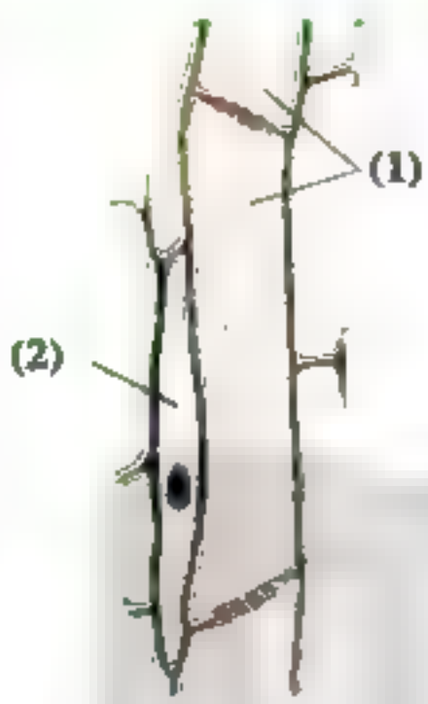
13 What happens in case of : the absence of the mitochondria from the phloem tissue in higher plants ?

14 "There is a relationship between the phloem tissue and the photosynthesis process".
How far this statement is correct ? With explanation.

UNIT 2

15 What is the similarity between : sclerenchyma tissue and xylem vessels ?

16 The two following figures represent conductive tissues in the plant, study them, then answer :



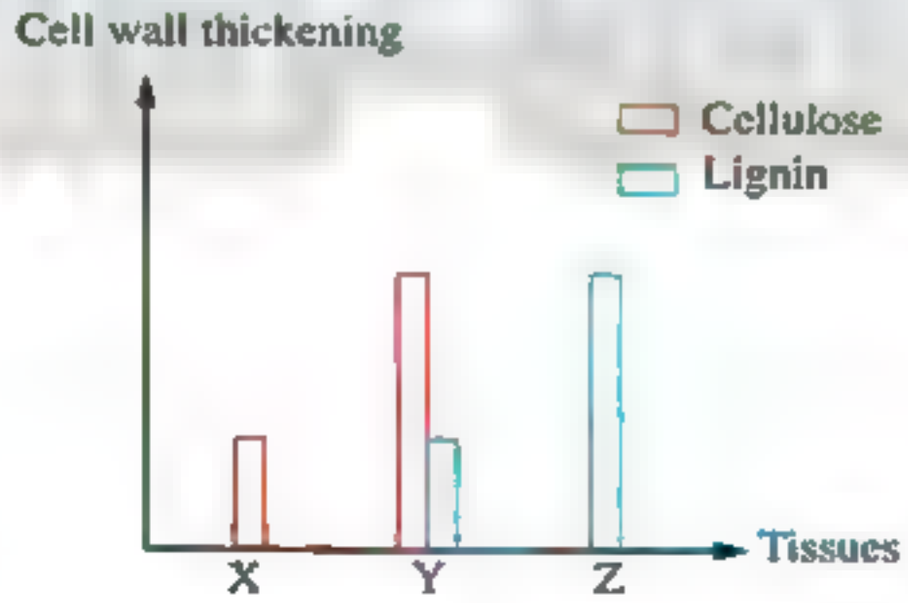
(X)


(Y)

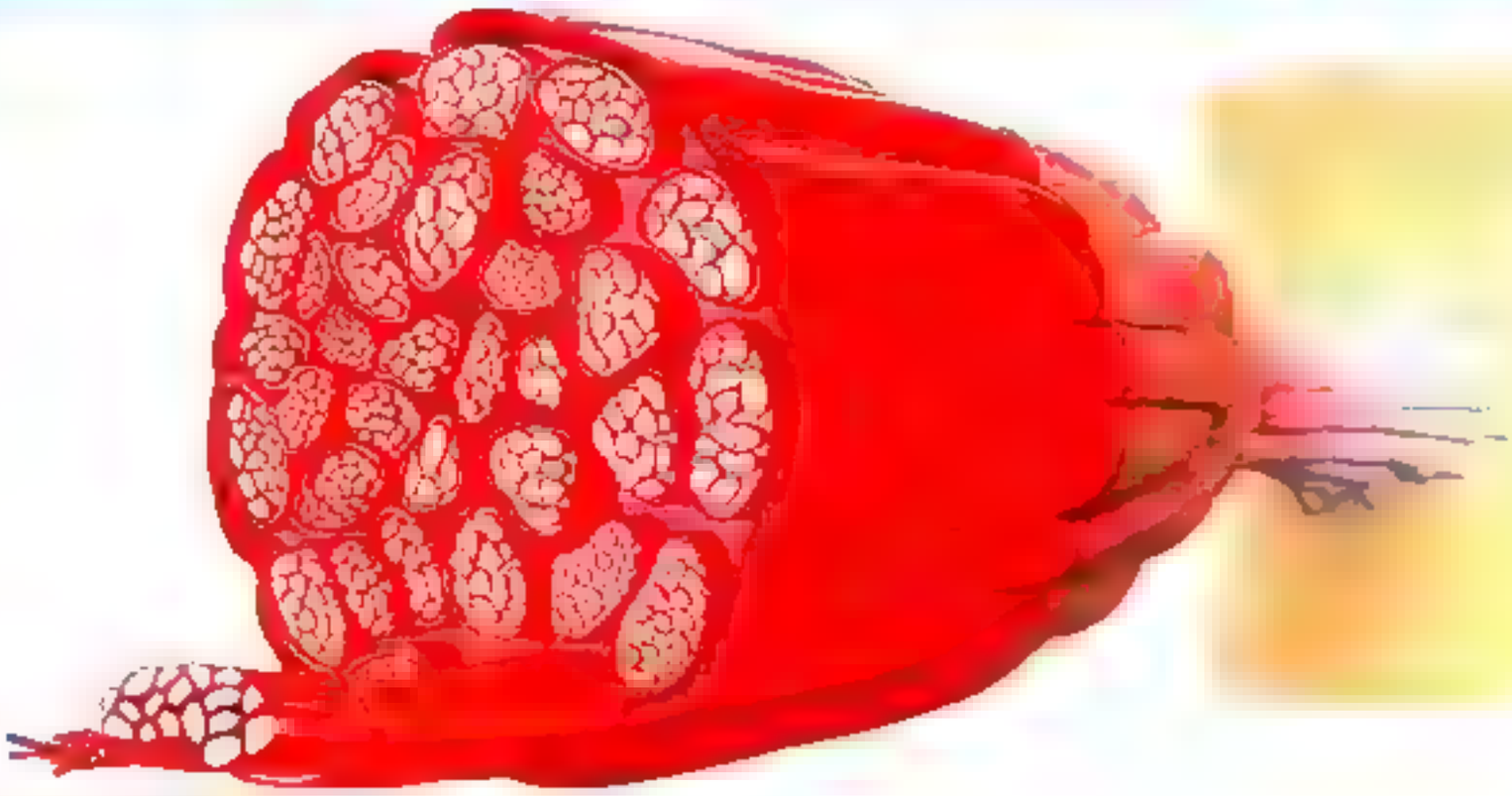
(a) What do the two figures (X) and (Y) represent ?
(b) What do the numbers (1) and (2) represent ?
(c) What is the difference between cell no. (1) and cell no. (2) ?
(d) What is the difference between figure (X) and (Y) ?

17 Explain : the efficiency of the phloem tissue decreases when the lack of mitochondria.

18 The following graph illustrates the thickening of cell walls in three types of cells that are present in plant tissues (X), (Y) and (Z), study it, then answer :



(a) What do the tissues (X), (Y) and (Z) represent ?
(b) What is the importance of each of the tissues (X), (Y) and (Z) ?
(c) What is the type of tissues (Y) and (Z) ?
(d) Give an example for the site of tissue (X).



CHAPTER 3

LESSON Two

Differentiation of Cells and Diversity of Animal Tissues

Animal tissues

- Animal tissues can be differentiated into four basic types, where each of them is adapted to the function it performs, as follows :

1. **Epithelial tissues**
   - Simple epithelial tissue
     - Simple squamous tissue
     - Simple cuboidal tissue
     - Simple columnar tissue
   - Compound (Stratified) epithelial tissue
     - Stratified squamous tissue
2. **Connective tissues**
   - Connective tissue proper "Loose connective tissue"
     - Skin dermis
     - Mesentery
   - Skeletal connective tissue
     - Bone
     - Cartilage
   - Vascular connective tissue
     - Blood
     - Lymph
3. **Muscular tissues**
   - Smooth muscles
   - Skeletal muscles
   - Cardiac muscles
4. **Nervous tissues**

UNIT 2

1 Epithelial tissues

Structure they are composed of a great number of closely adjacent cells that are connected together by a little interstitial (intercellular) substance.

Location they cover the outer surface of the body or line the body's internal cavities.

Functions they perform different functions, depending on their site in the body, **such as :**

1. Absorbing water and digested food as in the lining of the digestive canal.
2. Protecting the cells which they cover from harms, drought and pathogens (as microbes) as in the skin epidermis.
3. Secreting the mucus to keep the cavities that they line smooth and moist as in the lining of the digestive canal and trachea.

Do you know ... ?

- Epithelial tissues contain no blood vessels, so they receive nourishment via diffusion of substances from the underlying connective tissue, through the basement membrane.

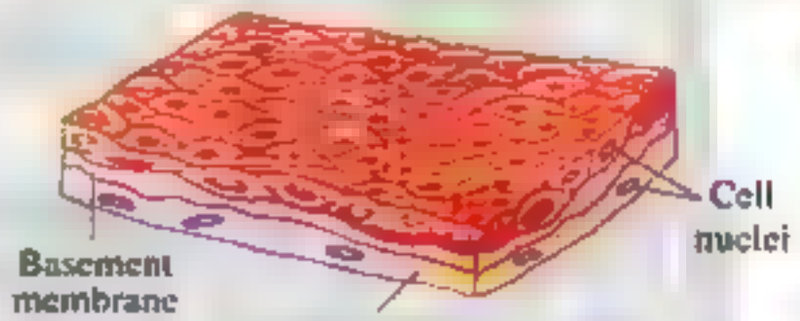
Types

They are divided into two main types, according to their shape and structure, **which are :**

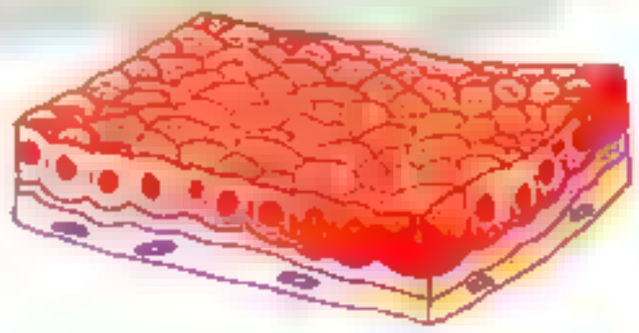
A Simple epithelial tissue

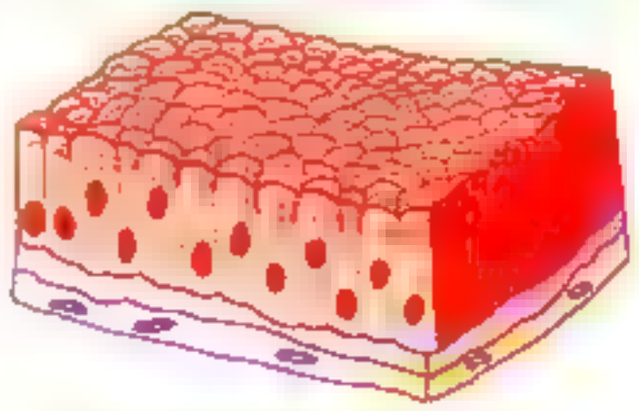
- Its cells are arranged in one layer, **such as :**

1 Simple squamous tissue :	• Consists of one layer of flattened cells. • **Site :** it is found in the lining (endothelium) of blood capillaries and the wall of alveoli in the lungs.
2 Simple cuboidal tissue :	• Consists of one layer of cuboidal cells. • **Site :** it is found in the lining of kidney tubules.
3 Simple columnar tissue :	• Consists of one layer of columnar cells. • **Site :** it is found in the lining of stomach and intestine.



Simple squamous tissue


Simple cuboidal tissue

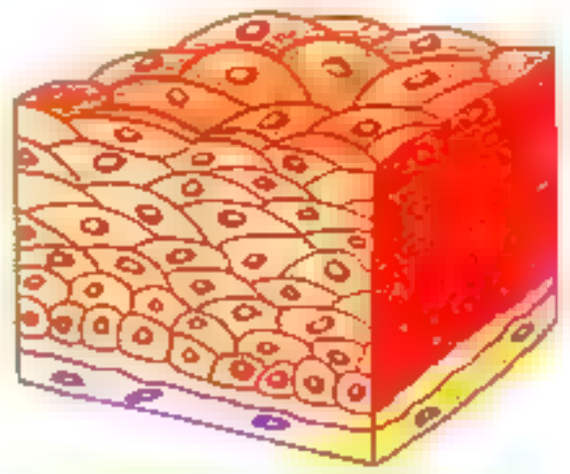

Simple columnar tissue

B Compound (Stratified) epithelial tissue

- Its cells are arranged in several layers.
- Example :

The stratified squamous tissue :

- It consists of several layers of compacted cells above each other.
- Its surface layer is squamous.
- **Site :** the tissue of skin epidermis.



Stratified squamous tissue

Test yourself

Choose the correct answer :

(1) The tissue that is lined the small intestine from the inside has a role in .....

ⓐ absorption process. ⓑ preventing it from drought.

ⓒ contraction and relaxation. ⓓ excretion process.

(2) From the tissues that prevents the entry of bacteria into the body is .....

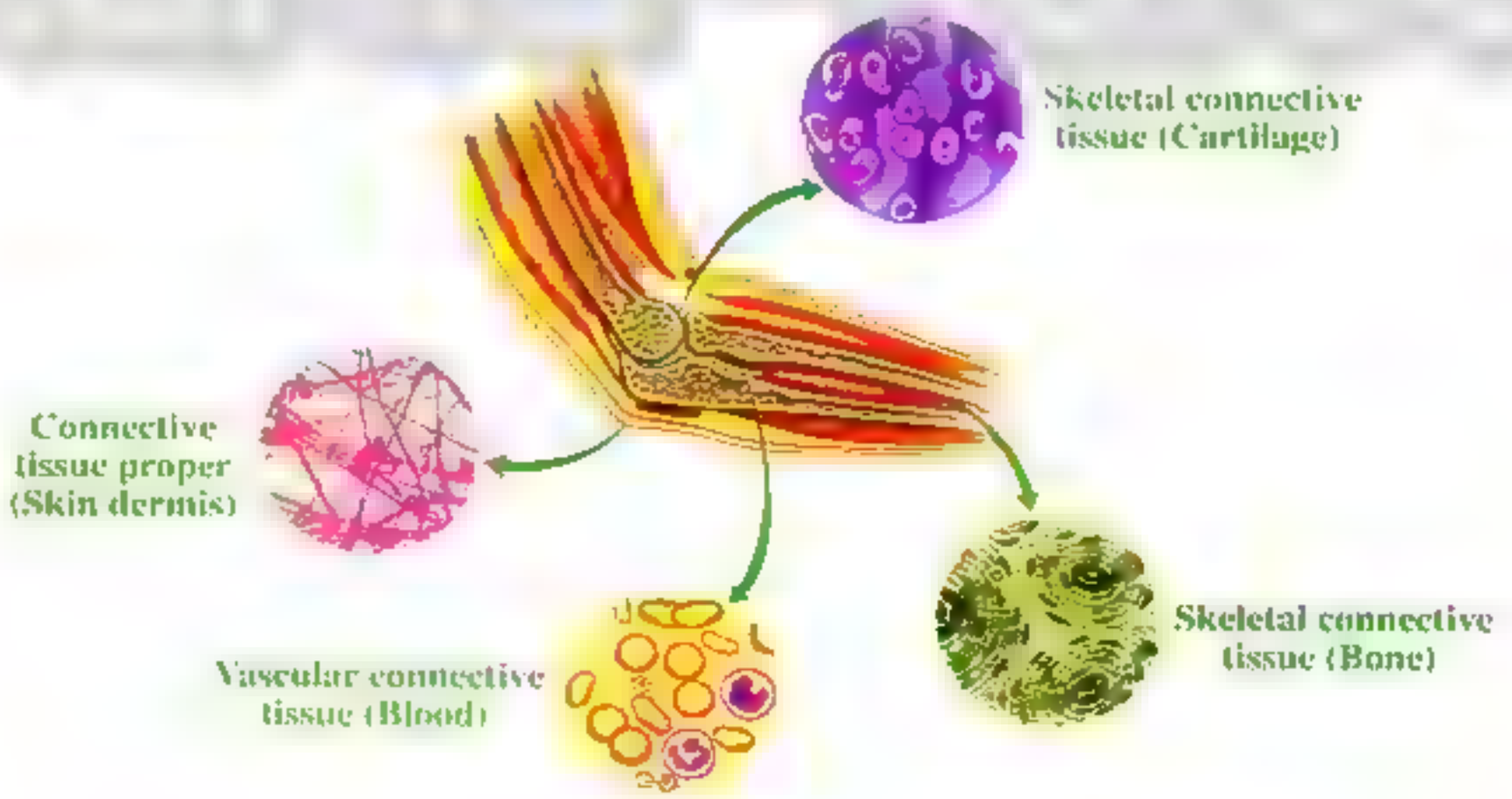
ⓐ simple cuboidal tissue. ⓑ simple squamous tissue.

ⓒ stratified squamous tissue. ⓓ simple columnar tissue.

2 Connective tissues

Structure they are made up of somewhat distant cells that are immersed in an intercellular substance which may be fluid or semi-solid or solid.

Types they are divided, according to the kind of intercellular substance, into three types :



UNIT 2

1 Connective tissue proper "Loose connective tissue" :

- **Characteristics :**
  - It is the most widely spread type.
  - It gathers between being fairly solid and quite elastic (semi-solid).
- **Function :**
  It connects the different body tissues and systems with each other.
- **Site :**
  It is found under the skin epidermis (skin dermis) and in the mesentery.

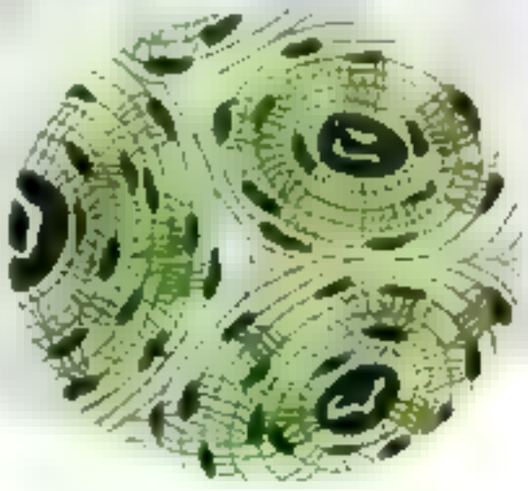
Connective tissue proper (Skin dermis)

For illustration only

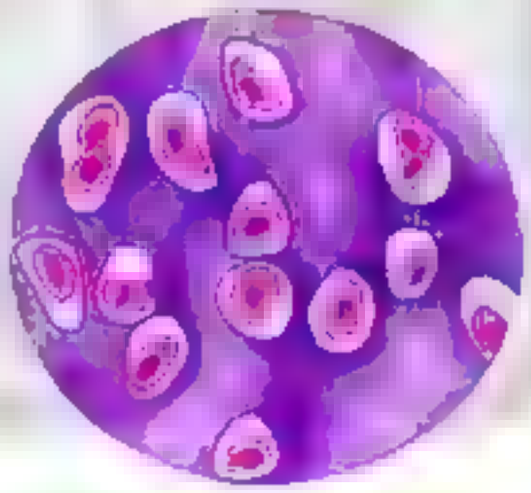
Mesentery : is a membrane that attaches the folds of the small intestine together.

2 Skeletal connective tissue :

- **Characteristics :**
  Its intercellular substance is solid in which calcium deposits in case of the bones.
- **Function :**
  Supporting the body.
- **It includes :** bones and cartilages.



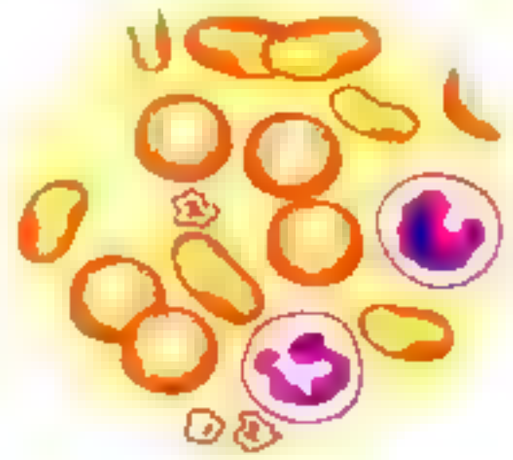
Skeletal connective tissue (Bone)



Skeletal connective tissue (Cartilage)

3 Vascular connective tissue :

- **Characteristics :**
  Its intercellular substance is fluid.
- **Function :**
  Transporting the digested food, gases and excretory substances.
- **It includes :**
  Blood and lymph.



Vascular connective tissue (Blood)

Test yourself

Choose the correct answer :

(1) Which of the following tissues is affected, due to the suffering of a person from an ulcer in stomach ? .....

ⓐ Squamous epithelial tissue. ⓑ Columnar epithelial tissue.
ⓒ Cuboidal epithelial tissue. ⓓ Connective tissue proper.

(2) Each of the following consists of connective tissue, except .....

ⓐ pavilion of ear. ⓑ lymph. ⓒ skin epidermis. ⓓ skin dermis.

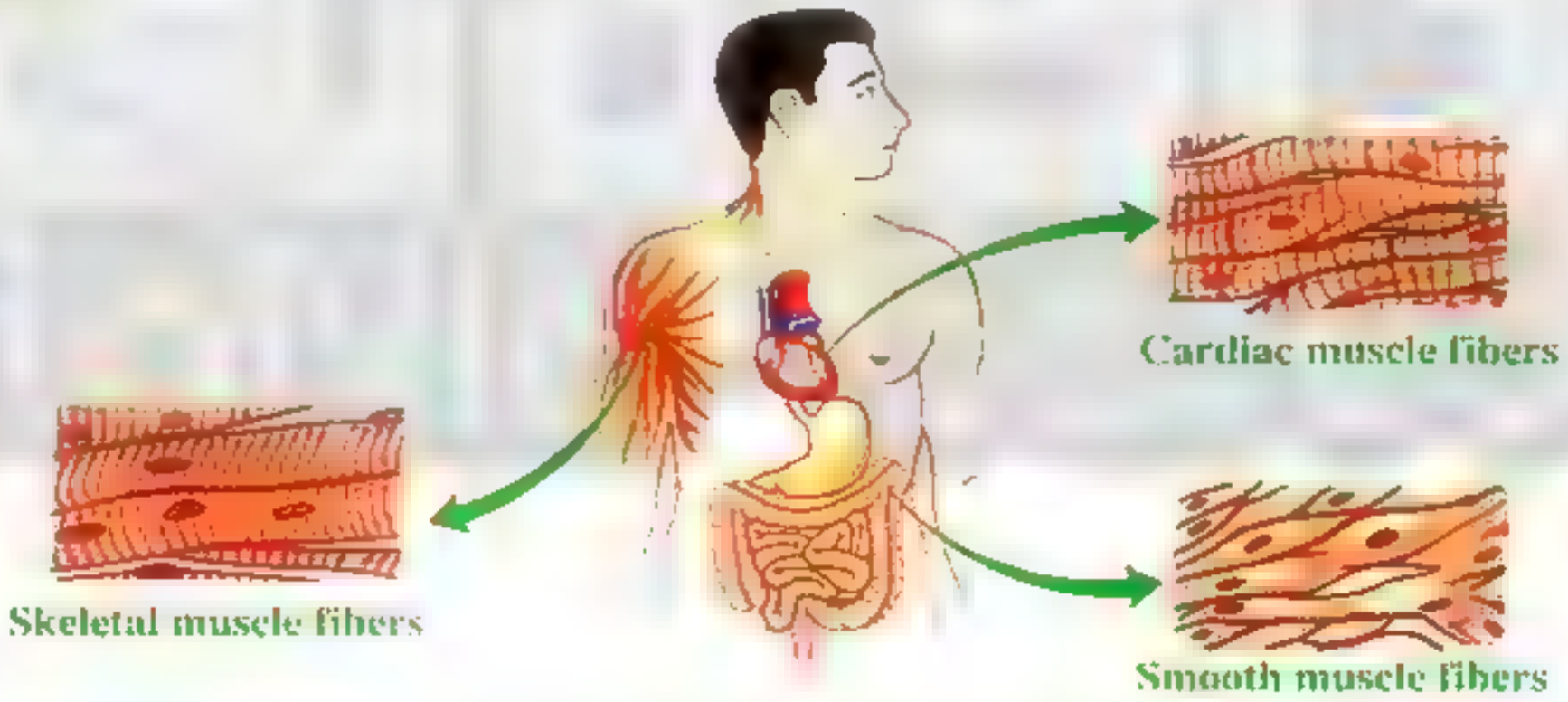
3 Muscular tissues

Structure they are made up of cells known as muscular cells or muscle fibers.

Characteristics

They are distinguished from the other body cells by their ability of contraction and relaxation which helps the living organism to move.

Types they are divided into three types :

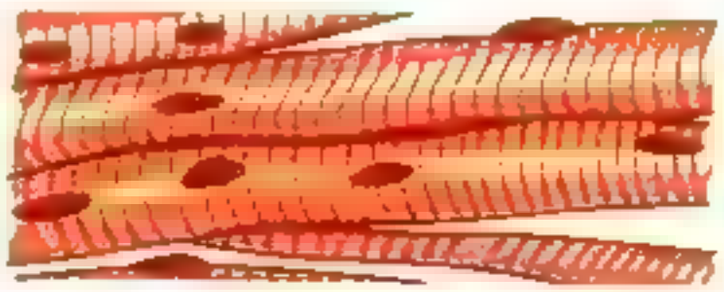
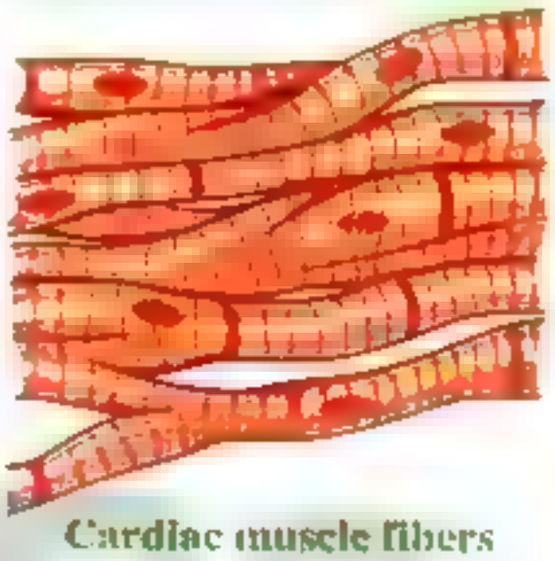


1 Smooth muscles :

- **Structure :** They consist of unstriated involuntary muscle fibers.
- **Site :** They are present in the walls of viscera. such as the walls of the digestive canal, the urinary bladder and the blood vessels.

Smooth muscle fibers

UNIT 2

② **Skeletal muscles :**	• **Structure :** They consist of striated voluntary muscle fibers. • **Site :** They are usually present connected with the skeleton, **such as** the muscles of arms, legs and trunk.  Skeletal muscle fibers
③ **Cardiac muscles :**	• **Structure :** - They consist of striated involuntary muscle fibers. - They contain intercalated discs that bind the muscle fibers together and make the heart beating in a rhythmic way as one functional unit. • **Site :** They are present in the heart wall only.  Cardiac muscle fibers

3 Test yourself

Choose the correct answer :

The tissue that is responsible for the movement of fingers is .....

ⓐ smooth muscular tissue. ⓑ skeletal muscular tissue.

ⓒ cardiac muscular tissue. ⓓ simple epithelial tissue.

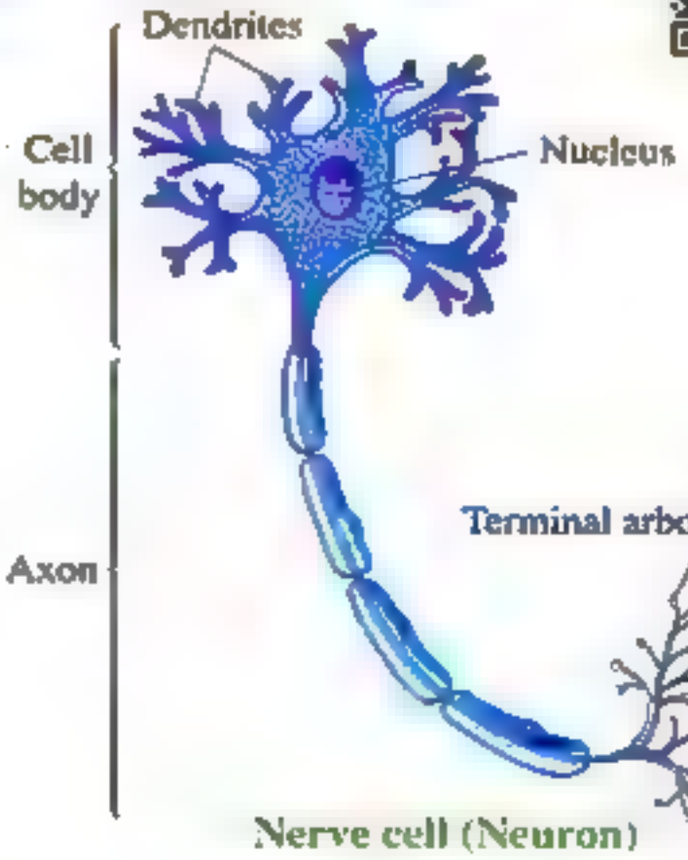
4 Nervous tissues

Structure

They consist of cells called the nerve cells (neurons). The nerve cell is considered the building and functional unit of the nervous system.

Function

The nervous tissues are responsible for regulating the different activities of the body organs, because they are specialized in receiving both the internal and external sensory stimuli and conducting them to the brain and spinal cord, then transmitting the motor nerve impulses from one of them to the effector organs (muscles or glands).



Nerve cell (Neuron)

Test yourself

Choose the correct answer :

The nerve cells are necessary for the animal, because .....

(a) they act as the communication means among the different cells.

(b) they transfer the nutrients to the different cells.

(c) they regulate the cell division.

(d) they are responsible for the exchange of gases in the body.

Practical Activity 8 Examining different types of plant and animal tissues

1. Used materials and tools :

- Prepared slides of various plant and animal tissues.
- A compound light microscope.

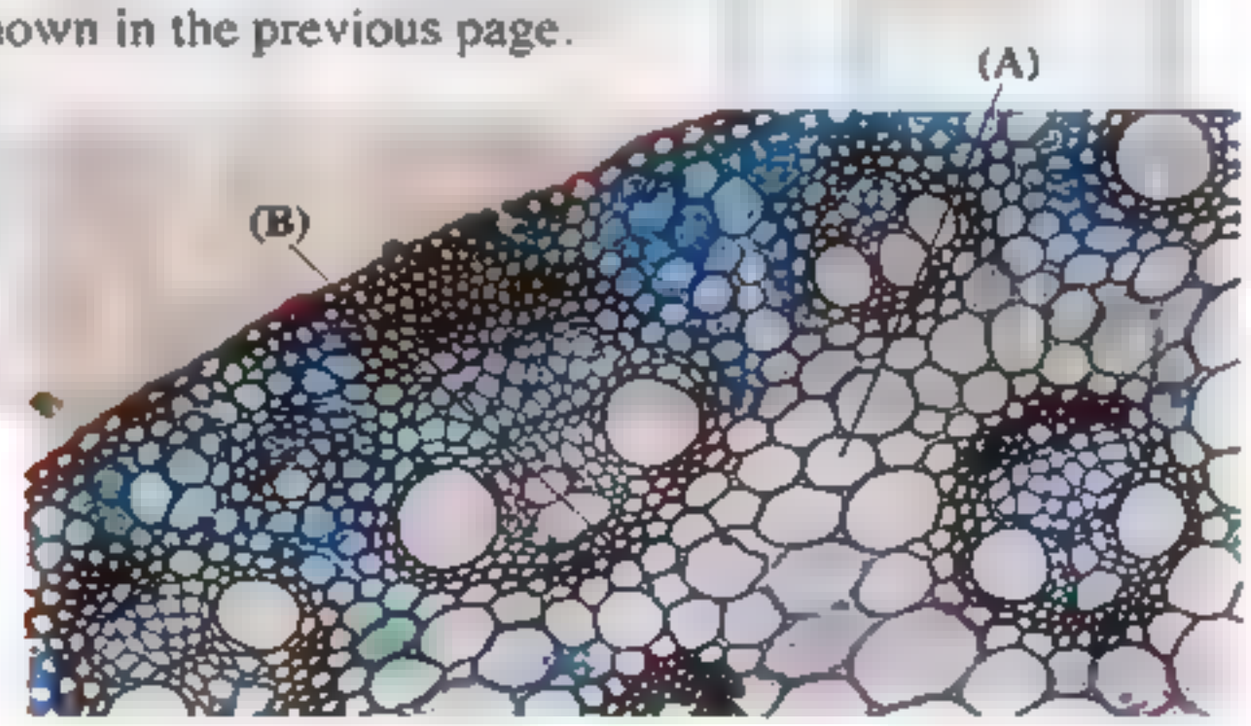
2. Procedures :

1 Microscopically examine the group of slides that your teacher will give you.

2 Compare these slides with the following figures of tissues.

3 Specify the types of tissues shown in the previous page.

Slide (1)



Slide (2)

Slide (3)

Slide (4)

Slide (5)

UNIT 2

3. Observation and conclusion :

Slide no.	Name of tissue	Type
(1)	Phloem tissue.	Compound plant tissue.
(2)	(A) Parenchyma tissue. (B) Sclerenchyma tissue.	(A) Simple plant tissue. (B) Simple plant tissue.
(3)	Skeletal muscle fibers.	Animal tissue (Muscular tissue).
(4)	Simple columnar tissue.	Animal tissue (Simple epithelial tissue).
(5)	Cardiac muscle fibers.	Animal tissue (Muscular tissue).

5 Test yourself

Classify the following cells into their different tissues that belong to :

(1) Blood cells.
(2) Spinal cord cells.
(3) Parsley stem cells.
(4) Skin epidermis cells.
(5) Mesentery cells.
(6) Potato tuber cells.

Science, Technology and Society

1 Stem cells

Stem cells

- They are cells that have the ability to form any other type of specialized cells, such as muscular cells, liver cells, nerve cells and skin cells, according to specific environmental treatments at the laboratory.
- They are formed during the early stages of the embryonic development.

Stem cells in the early development stages of a fetus

Role of stem cells

The scientists and doctors have a great hopes in treating a group of intractable diseases, such as :

1. They are used to produce **dopamine substance** which is used to treat some nervous diseases as **Parkinson's disease.**

2 They are transplanted to give cardiac muscle cells as a compensation for the damaged cardiac muscles in the heart patients.

3 They are used to obtain cells that produce insulin hormone as a compensation for the decrease in secretion of this hormone by pancreas in the diabetic patients.

2 Cell fractionation

Cell fractionation

It is one of the modern technologies that is used in :

1 Studying each type of the different cells that form a certain tissue.

2 Studying the different organelles that are formed of one type of cells and this includes studying the site of these organelles, their functions and their components.

3 Studying the biological macro-molecules, such as enzymes.

4 Studying the biological processes that occur inside the cell.

Ultracentrifuge apparatus

Methods of using cell fractionation technology

Cell fractionation technology depends on using ultracentrifuge apparatuses to separate the cell components at different speeds, depending on the difference of their densities.

CHAPTER 3

QUESTIONS ON LESSON Two

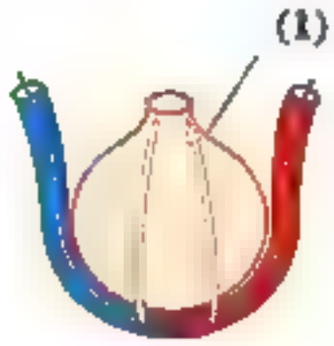
Differentiation of Cells and Diversity of Animal Tissues

Interactive test

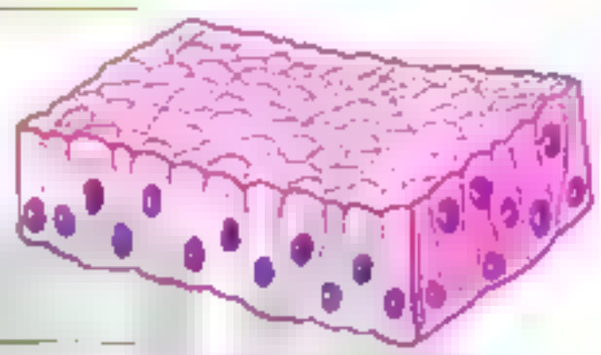
The questions signed by measure the high levels of thinking.

First Multiple Choice Questions

1 The opposite figure represents an alveolus in the lung, which of the following represents the shape of the cell in no. (1) ? .....



2 The opposite figure represents the structure of ■ tissue that is present in ..... system.



(a) respiratory (b) urinary
(c) digestive (d) circulatory

3 The opposite figure represents the structure of a tissue that is present in ..... system.

(a) respiratory (b) urinary
(c) digestive (d) nervous

4 The absorption of the glucose in small intestine takes place through ..... epithelial tissue cells.

(a) simple cuboidal (b) simple columnar (c) simple squamous (d) compound

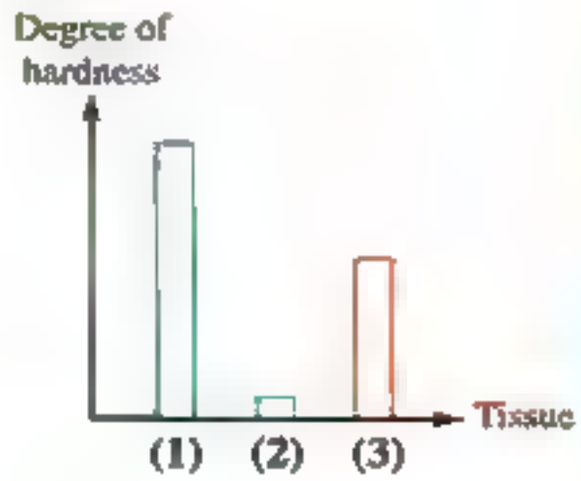
5 Cartilaginous rings forming the trachea are from the tissues that are devoid of calcium and they are from the tissues that perform the .....

(a) support. (b) sensation. (c) digestion. (d) transportation.

6 An infant suffers from a severe decrease in calcium element, which of the following is more affected ? .....

(a) The body length. (b) Skin colour. (c) The hair length. (d) Eye colour.

7 The opposite graph illustrates the degree of hardness of three animal tissues, which of the following represents the bones and cartilages respectively ? .....



(a) (2) and (1). (b) (1) and (3).
(c) (3) and (1). (d) (1) and (2).

9 The tissue that transports oxygen and carbon dioxide gases is .....

(a) connective tissue proper. (b) skeletal connective tissue.
(c) vascular connective tissue. (d) compound epithelial tissue.

The head and limbs are moved by the action of ..... muscles.

(a) striated involuntary (b) unstriated voluntary
(c) unstriated involuntary (d) striated voluntary

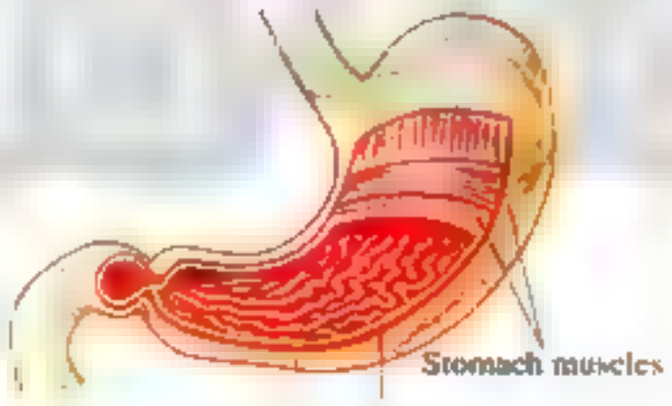
10 Which of the following tissues are found in the bronchioles ? .....

	Smooth muscles	Epithelial tissue	Cartilaginous tissue
(a)	✓	✓	✘
(b)	✘	✓	✓
(c)	✓	✘	✓
(d)	✓	✓	✓

11 "All animal cells are similar in the shape", "All animal cells are different from each other in the function", ...

(a) the two statements are correct.
(b) the two statements are wrong.
(c) the first statement is correct and the second statement is wrong.
(d) the first statement is wrong and the second statement is correct.

12 The following figure represents the human stomach, what do the tissues no. (1) and (2) represent ? .....



	Tissue no. (1)	Tissue no. (2)
(a)	Simple columnar epithelial tissue	Smooth muscles
(b)	Smooth muscles	Simple columnar epithelial tissue
(c)	Simple squamous epithelial tissue	Smooth muscles
(d)	Smooth muscles	Simple cuboidal epithelial tissue

UNIT 2

13 Which of the following are from the characteristics of the cardiac muscle ? .....
(a) Its cells are long and cylindrical in shape.
(b) Its cells are unstriated involuntary.
(c) Its cells are striated voluntary.
(d) Its cells are multinucleated and spindle in shape.

14 Which of the following consists of closely adjacent animal cells ? .....
(a) Blood. (b) Lymph. (c) Alveoli walls. (d) Skin dermis.

15 The opposite figure represents ..... muscle.
(a) striated involuntary
(b) striated voluntary
(c) unstriated involuntary
(d) unstriated voluntary

16 The following figures represent some animal tissues, study them, then answer :

(1) (2) (3) (4)

(1) The tissue that lines some blood vessels is no. .....
(a) (1). (b) (2). (c) (3). (d) (4).

(2) The tissue that is found in the walls of the blood vessels is no. .....
(a) (1). (b) (2). (c) (3). (d) (4).

(3) The tissue that is responsible for the movement of the back region is no. .....
(a) (1). (b) (2). (c) (3). (d) (4).

(4) The tissue that is responsible for the movement of blood inside the blood vessels is no. .....
(a) (1). (b) (2). (c) (3). (d) (4).

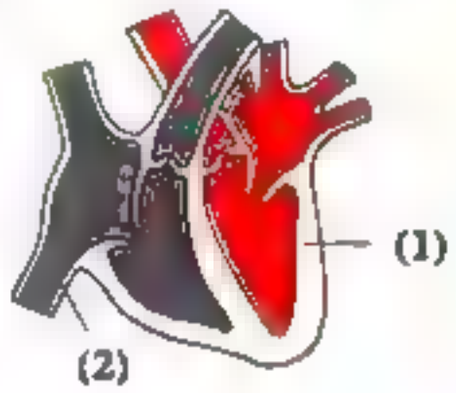
(5) The tissue containing structures that makes the organ found in it act as one functional unit is no. .....
(a) (1). (b) (2). (c) (3). (d) (4).

17 Skeletal muscle cells are characterized by all of the following, except that .....
(a) they store glycogen.
(b) they contain a large number of mitochondria.
(c) they are cylindrical in shape.
(d) they contain intercalated discs.

18 The tissues that are found in the walls of veins are .....
(a) simple squamous epithelial tissues. (b) smooth muscular tissues.
(c) skeletal muscular tissues. (d) cardiac muscular tissues.

19 The tissues that help in the movement of two upper limbs are .....
(a) simple squamous epithelial tissues. (b) smooth muscular tissues.
(c) skeletal muscular tissues. (d) cardiac muscular tissues.

20 The opposite figure represents the human heart, study it, then answer :



(1) The part no. (1) consists of .....
(a) connective tissue.
(b) unstriated involuntary muscles.
(c) striated involuntary muscles.
(d) smooth muscles.

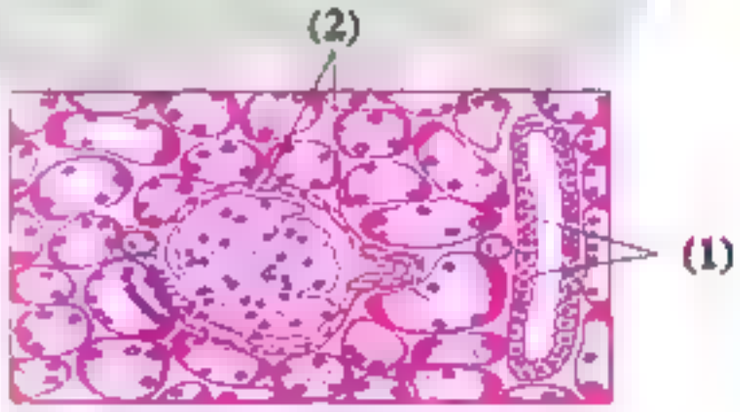
(2) The fluid no. (2) consists of .....
(a) connective tissue. (b) nervous tissue.
(c) muscular tissue. (d) epithelial tissue.

Second Miscellaneous Questions

1 Give reason for : the epithelial tissues cover the body surface externally.

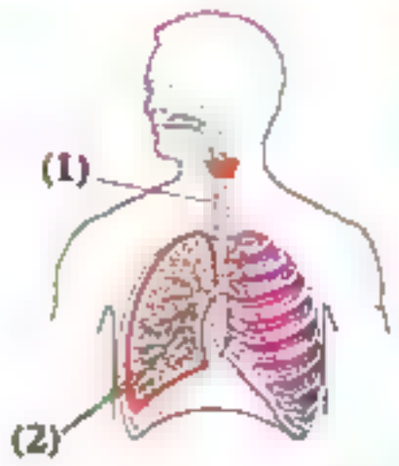
2 If you know that the circulatory system consists of heart. blood vessels and blood. **In the light of your study,** illustrate the types of the tissues that are found in the components of the circulatory system.

3 The opposite figure illustrates the tissue structure in a section of kidney, in the light of your study for the characteristics of animal tissues :



(a) **Determine** the type of tissues that are found in the illustrated parts in this section.
(b) **Which** of the parts (1) and (2) represent the kidney tubules ?

4 The opposite figure illustrates the respiratory system in human, study it, then answer :



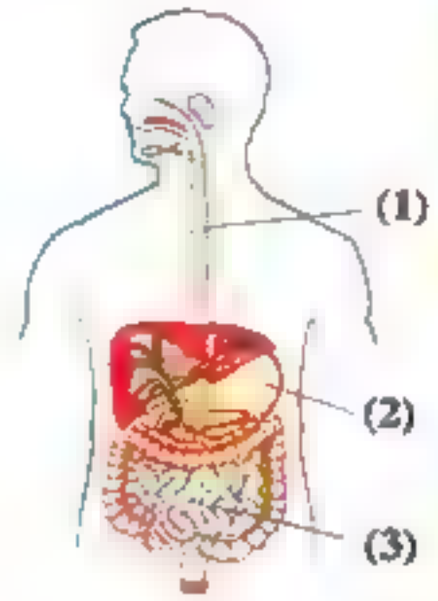
(a) **Illustrate** the type and the importance of the tissue that is found in structure no. (1).
(b) **Illustrate** the type of the tissue that is found in the wall of structure no. (2).

UNIT 2

5 The opposite figure illustrates the digestive system in human, study it, then answer :

(a) **What** is the type of the tissue that is found in the lining of structures no. (2) and (3) ?

(b) **What** is the name of the tissue that is found in the wall of structure no. (1) ?

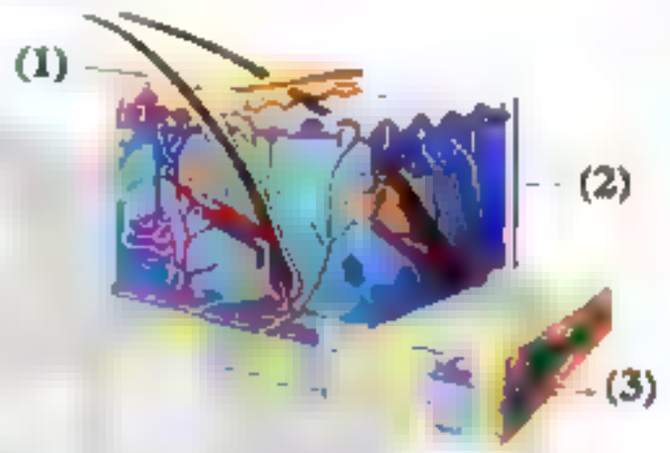


6 Give reason for : the skin is considered a compound tissue.

7 What happens if : the intercellular substance of the vascular connective tissue is changed ?

8 What happens in case of : the deposition of calcium in the intercellular substance of the cartilage tissue ?

9 The opposite figure illustrates a section in the human skin, study it, then answer :



(a) **What** is the type of the tissue that is found in no. (1) ?

(b) **What** is the type of the tissue that is found in no. (2) ?

(c) "If you know that structure no. (3) carries the blood from the heart to all the body parts and vice versa", **show** the type of the tissues that are found in the wall of structure no. (3).

10 "When playing a football, the most muscles that are under control are the smooth muscles". How far this statement is correct ? With explanation.

11 Give reason for : the bones are harder than the cartilages.

12 Give reason for : naming the skeletal muscles by this name.

13 From the following figures :

(1) (2) (3)

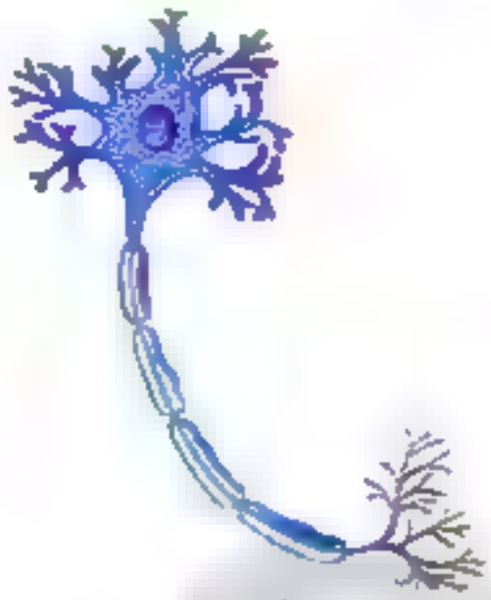
Write the number and the name of figure that indicates each of the following statements :

(a) It is found in the wall of the muscular sac in which the urine accumulates.

(b) It is found in the lower limbs in the human body.

(c) It contains structures that have an important role in the regulation of the heartbeats.

14 Study the following figures, then **show** the relationship between figure no. (1) and figure no. (2).



(1)

(2)

15 "Muscular tissues that are responsible for the regulation of the action of all organs in the body".
How far this statement is correct ? With explanation.

16 "There is a relationship between the brain and the functions of some glands".
How far this statement is correct ? With explanation.

17 The following table illustrates two types of animal tissues (X) and (Y) :

	Tissue (X)	Tissue (Y)
Shape of cells	Long	Long
Cell division	Doesn't divide	Divides

(a) Determine the name of each of tissues (X) and (Y).
(b) Conclude a characteristic that is characterized tissue (Y) and helps it to do its function.
(c) Give an example for the site of each of tissues (X) and (Y).

Model Exam on

Chapter 3

Differentiation of Cells and Diversity of Plant and Animal Tissues

Choose the correct answer (1 : 10) :

The following figure illustrates some animal tissues, examine it, then answer :

1 Which of the following tissues the digested food molecules transfer through ? .....
ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

2 The tissue that covers the body is no. .....
ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

3 The tissue whose cells contain the largest number of lysosomes is no. .....
ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

4 The tissue that is responsible for the extraction of urine from the blood is no. .....
ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

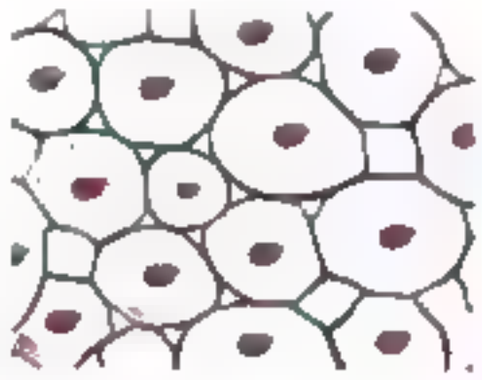
5 "The walls of plant tissues contain cellulose substance", "All the plant tissues can perform the photosynthesis process", ...
ⓐ the two statements are correct. ⓑ the two statements are wrong.
ⓒ the first statement is correct and the second statement is wrong.
ⓓ the first statement is wrong and the second statement is correct.

6 During the movement or practicing the exercises, the internal organs don't collide with the internal cavity of the abdomen with each other, because they are attached together with ..... tissue.
ⓐ simple squamous epithelial ⓑ simple columnar epithelial
ⓒ connective proper ⓓ musclular

7 The bolus of food transfers from the pharynx to the stomach through the esophagus, this is due to .....

ⓐ the contraction and relaxation of striated voluntary muscles.
ⓑ the contraction and relaxation of striated involuntary muscles.
ⓒ the contraction and relaxation of unstriated voluntary muscles.
ⓓ the contraction and relaxation of unstriated involuntary muscles.

8 The opposite figure illustrates a microscopic image for a tissue in the potato tuber, what does this figure represent ? .....



ⓐ Parenchyma tissue has a main role in the storage of the nutrients.
ⓑ Sclerenchyma tissue has a main role in supporting the plant.
ⓒ Parenchyma tissue has a main role in the photosynthesis process.
ⓓ Collenchyma tissue has a main role in supporting the plant.

9 Which of the following tissues doesn't participate in supporting the plant ? .....

ⓐ Xylem. ⓑ Phloem.
ⓒ Collenchyma tissue. ⓓ Sclerenchyma tissue.

10 In front of you, the figure represents some cells of an animal tissue that .....

ⓐ secretes the mucus.
ⓑ absorbs the digested food.
ⓒ transfers the digested food and wastes.
ⓓ Protects the body against microbes.

Answer the following questions (11 : 17) :

11 The internal skeletons of fish consist of tissues whose cells differ in their contents as chemical substances to be suitable for the depth of water where they live, from the previous we conclude that there are flexible fish skeletons and others are more harder. **In the light of your study, conclude** the type of the tissue in the two cases.

UNIT 2

12 "The transport process in the plant depends on the living cells only".
How far this statement is correct ? With explanation.

13 What is the similarity between : the cardiac muscle and the muscles of the leg ?

14 The following table illustrates the percentage of some organelles that are found in a number of animal tissues, study it, then answer :

Organelle / Tissue	Mitochondria	Ribosomes	Lysosomes
(1)	70%	10%	20%
(2)	40%	30%	30%
(3)	20%	70%	10%
(4)	20%	10%	70%

Conclude which of the previous tissues :
(a) Represents the vascular connective tissue.

(b) Plays an important role in flying of birds.

15 In a public garden. an agricultural worker made a mistake by removing the external layer of the tree trunk on 1.5 meter high from the surface of the ground. if you know that the height of this tree is about 30 meters and the removed layer contains a phloem tissue, while the xylem tissue is not affected. after 10 days this tree started to fade and die. Explain this in the light of your study.

16 What happens if : the stratified epithelial tissue is absent from its positions ?

17 What is the relation between : the nervous tissue and the body movement ?

ACCUMULATIVE EXAM ON

UNIT 2

Cell : Structure and Function

Choose the correct answer (1 : 10) :

1 Cells of the living organism body differ in the .....

(a) shape. (b) size.

(c) structure. (d) all the previous.

2 Scanning electron microscope helps us to .....

(a) see the inside of a sample.

(b) see the atoms of the sample.

(c) see the texture of the sample.

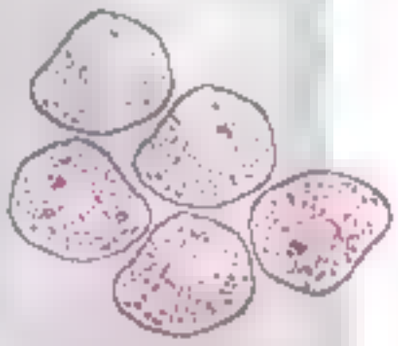
(d) see the electrons of a sample.

3 The opposite diagram shows some liver cells as they appear under the microscope :

How many cell walls can be seen ? .....

(a) 3 (b) 5

(c) 0 (d) 2



4 The ..... is(are) the most obvious organelle(s) under the microscope.

(a) ribosomes (b) endoplasmic reticulum

(c) nucleus (d) lysosomes

5 Centriole consists of a number of microtubules arranged in ..... groups.

(a) 3 (b) 6 (c) 9 (d) 10

6 The lysosomal bodies digest the organic compounds by the secretion of .....

(a) hormones. (b) enzymes.

(c) alkaline substances. (d) (a) and (b).

UNIT 2

7 Which of the following represents an organ ? .....

ⓐ ⓑ ⓒ ⓓ

8 What are the features of xylem vessels ? .....

	Absorption	Conduction	Photosynthesis	Support
ⓐ	✓	✓	✓	✗
ⓑ	✓	✓	✗	✗
ⓒ	✗	✓	✗	✓
ⓓ	✗	✗	✓	✓

9 The ..... is a simple plant tissue whose cells are thickened by lignin.

ⓐ parenchyma ⓑ collenchyma ⓒ chlorenchyma ⓓ sclerenchyma

10 The intercalated discs are found in ..... muscles.

ⓐ striated ⓑ smooth ⓒ cardiac ⓓ all the previous

Answer the following questions (11 : 17) :

11 "There is a relationship between the cell shape and its function".
How far this statement is correct ? With explanation.

12 **Give reason for :** it is not preferred to add stains to the specimens of living organisms, when examining them.

Accumulative Exam

13 Calculate the magnifying power of the objective lens, if you know that the magnifying power of the microscope equals (600x) and the magnifying power of eyepiece is (15x).

14 Show the relationship between the nucleus and protein.

15 "Lysosomes have an immunization role in the body". Explain this statement.

16 What happens if : the parenchyma tissue doesn't contain vacuoles ?

17 From the opposite figure :

(a) What does this figure represent ?

(b) This figure plays an important role in regulating the different activities of the body organ. Explain.

10 MODEL EXAMS

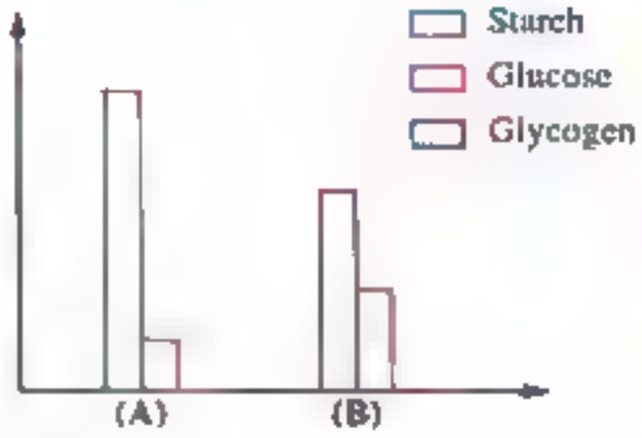
Evaluate yourself through interactive exams by scanning this QR code.

And after finishing each exam, you can view a detailed report of your answers to evaluate yourself.

Model Exam 1

Choose the correct answer (1 : 10) :

1 The opposite graph illustrates molecules stored energy in two cells (A) and (B), which of the following expresses this graph accurately ? .....

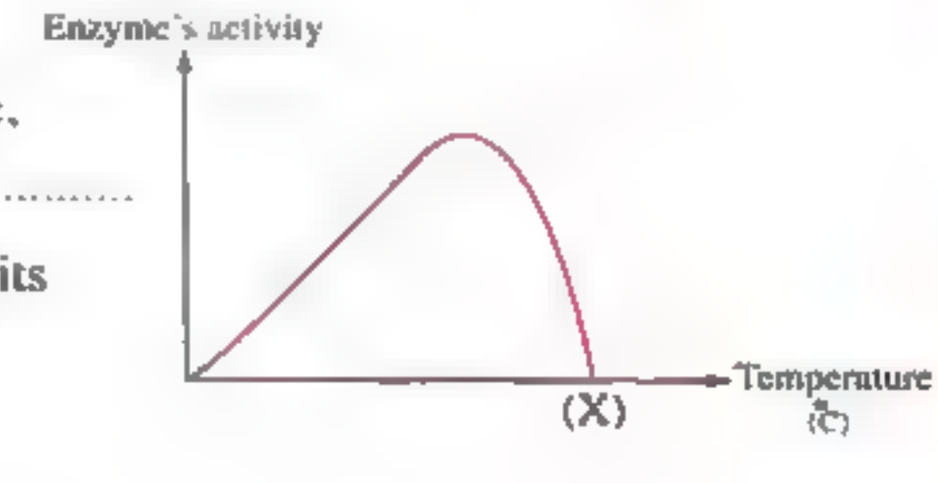


(a) (A) represents a liver cell and (B) represents a plant cell.
(b) (A) represents a muscular cell and (B) represents a liver cell.
(c) (A) represents a muscular cell and (B) represents a plant cell.
(d) (A) represents a plant cell and (B) represents a muscular cell.

2 Which of the following can be seen by the light microscope ? .....
(a) Red blood cell.
(b) Virus.
(c) Nuclear envelope.
(d) Internal structure of the chloroplast.

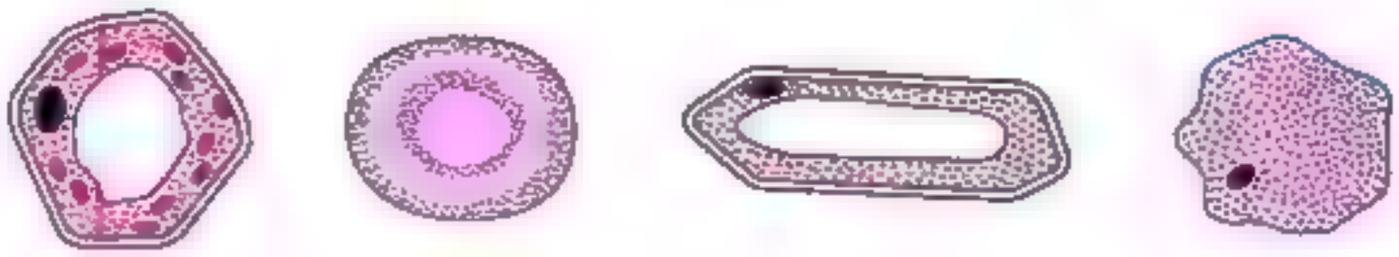
3 Plasma membrane is similar to the nuclear membrane in that both of them .....
(a) consist of two layers.
(b) are characterized by the selective permeability.
(c) contain gates.
(d) separate between the cell contents and surrounding medium.

4 The opposite graph illustrates the effect of the temperature on the activity of an enzyme, what happened for this enzyme at point (X) ? .....



(a) The nature of the enzyme is changed and its activity stops.
(b) The enzyme is consumed.
(c) The activity of the enzyme increases.
(d) The activity of the enzyme is constant.

5 All the following cells are similar in the presence of .....



(a) plasma membrane. (b) cell wall. (c) plastids. (d) nucleus.

6 The components of four different types of food were tested and the results recorded in the following table. which type of food contains sugar, starch and protein respectively ? .....

	Benedict's test	Iodine test	Biuret's test
(a)	Blue	Orange	Violet
(b)	Orange	Blue	Violet
(c)	Orange	Orange	Blue
(d)	Blue	Blue	Blue

7 Study the following table, then determine :

	Cell (1)	Cell (2)	Cell (3)	Cell (4)
Amount of cellulose in the cell wall :	100 nm	Zero	200 nm	100 nm
Amount of the other substances in the cell wall :	80 nm	Zero	Zero	Zero

Which cell belongs to the parenchyma tissue. knowing that the thickness of the cell wall without sediments equals = 100 nm ? .....

(a) Cell (1). (b) Cell (2). (c) Cell (3). (d) Cell (4).

8 The organelle that is the most active during doing exercises is .....

(a) ribosome.
(b) endoplasmic reticulum.
(c) mitochondria.
(d) lysosome.

9 Xylem tissue is thickened by .....

(a) cellulose only. (b) lignin only.

(c) suberin only. (d) cellulose and lignin.

10 The cells that line the trachea secretes a mucous substance, and this process passed through a number of stages, as follows :

1. Adding carbohydrate to protein.
2. Fusing the secretory vesicles with the plasma membrane.
3. Secretion of the protein from ribosomes.
4. Separation of the vesicles from Golgi apparatus.

The correct arrangement for these stages is .....

(a) (1) → (4) → (2) → (3). (b) (1) → (4) → (3) → (2).

(c) (4) → (1) → (2) → (3). (d) (3) → (1) → (4) → (2).

Answer the following questions (11 : 17) :

11 **Explain :** obese patients are advised by reducing the eating of meals rich in carbohydrates.

12 **What is the difference between :** chromatid and chromatin ?

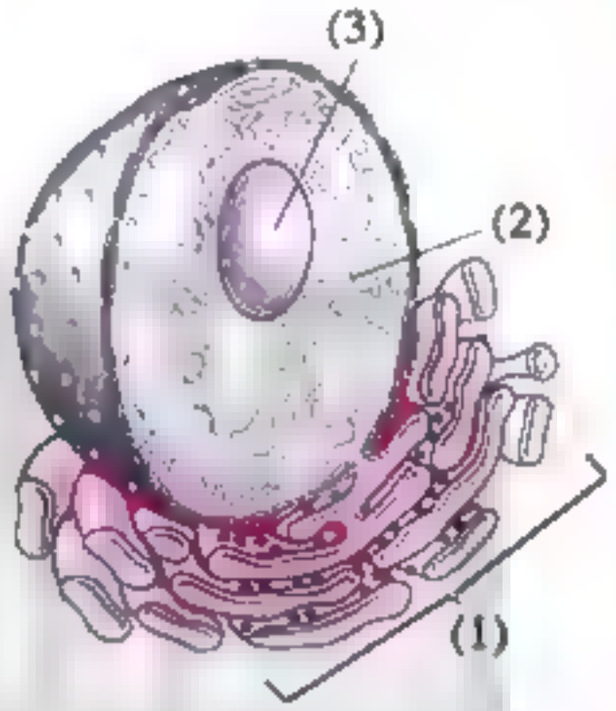
13 **What** are the elements that may be found in proteins and not found in carbohydrates ?

14 **What is the relation between :** the formation of starch and chloroplasts ?

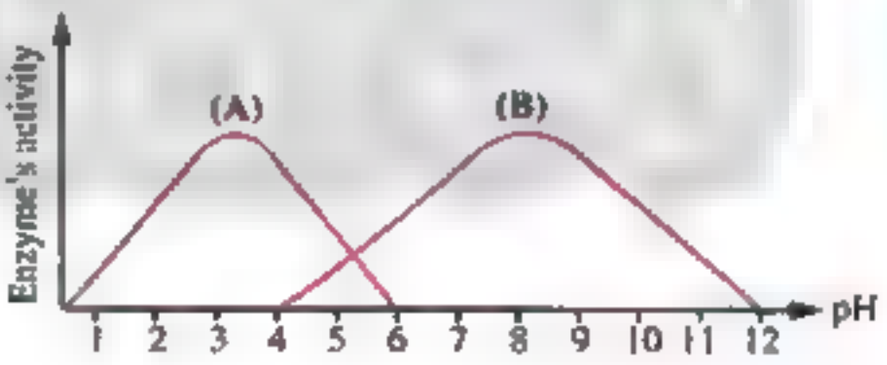
15 **Calculate :** the number of peptide bonds that are resulted from the binding of 20 amino acids.

16 **From the opposite figure :**

Write the name and the number of structure that is not found in the structure of the nucleus.



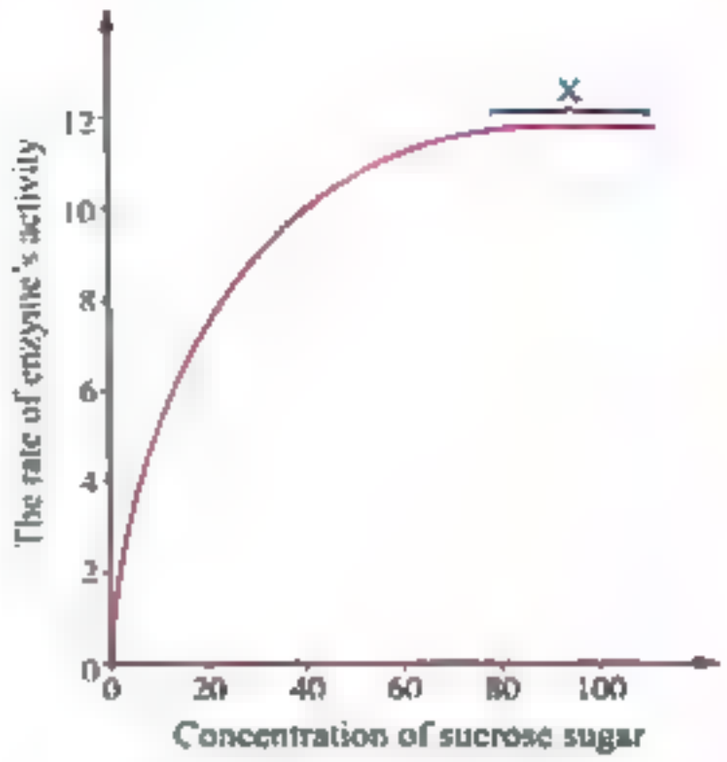
17 **The opposite graph illustrates the relation between two different enzymes (A) and (B) and pH value, conclude** the pH value at which the two enzymes (A) and (B) are most active.



Model Exam 2

Choose the correct answer (1 : 10) :

1 From the opposite graph that illustrates the relation between the rate of the activity of sucrase enzyme and the concentration of sucrose sugar. So, the activity of enzyme is constant at the part (X) because .....



(a) the enzyme's activity is inhibited.
(b) the substrate is consumed completely.
(c) the enzyme's concentration reduces the rate of the chemical reaction.
(d) the substrate's concentration reduces the rate of the chemical reaction.

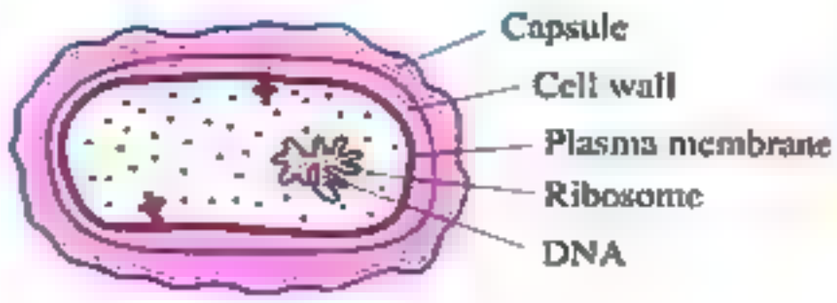
2 Which of the following can be seen when staining a plant cell and examined it under the microscope with magnifying power (400x) ? .....

	Endoplasmic reticulum	Mitochondria	Chromosomes	Cell wall
(a)	✓	✗	✓	✓
(b)	✗	✗	✓	✓
(c)	✗	✓	✓	✗
(d)	✓	✓	✗	✗

3 A digestive enzyme in human digests its substrate rapidly at temperature (35°C), what happens if the enzyme and its substrate work at temperature (50°C) ? .....
(a) The nature of the enzyme is changed and its work stops.
(b) The reaction continues with the same rate.
(c) The reaction occurs with a rapid rate.
(d) The reaction occurs with a slow rate.

4 In human blood, there are several types of white blood cells that can engulf, disintegrate and get rid of the microbes, while most of the plant cells can't do this, this is due to the presence of .....
(a) the cell membrane. (b) Golgi apparatus. (c) the chloroplasts. (d) the cell wall.

5 By using the opposite figure that illustrates a bacterial cell, which of the following components is found in each of the bacterial cell and animal cell ? .....



(a) Capsule, plasma membrane and cell wall.
(b) Capsule, DNA and ribosome.
(c) Plasma membrane, cell wall and DNA
(d) Plasma membrane, DNA and ribosome.

6 Which of the following organic molecules contains a free carboxyl group on its hydrolysis ? .....

(a) Phospholipids and polysaccharides.
(b) Phospholipids and proteins.
(c) Polysaccharides only.
(d) Proteins only.

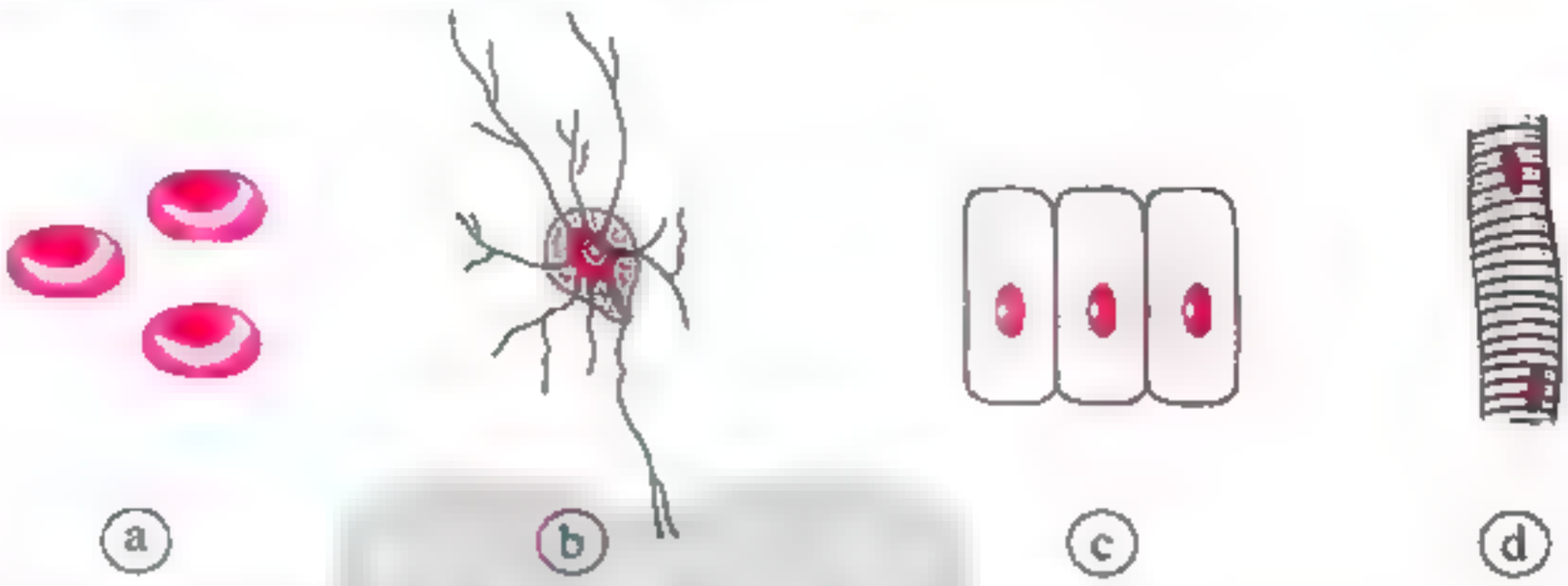
7 The opposite diagrammatic figure illustrates a part of the plasma membrane. Which of the following shows the correct pathway for the transport of glucose and water through the plasma membrane respectively ? .....

	Glucose	Water
(a)	Y	X & Y
(b)	X & Y	Y
(c)	X & Y	X
(d)	X	X & Y

8 All the following substances may give a negative result with Sudan-4 stain, except .....

(a) all the substances that consist of monosaccharides.
(b) all the organic substances.
(c) all the substances that consist of fatty acids.
(d) all the substances that consist of amino acids.

9 The following figures illustrate four types of cells of some tissues in the living organisms, which tissue has the ability to contract ? .....



(a) (b) (c) (d)

10 Which of the following illustrates the correct pathway to produce a certain enzyme ? .....

(a) Ribosomes ⟶ Golgi body ⟶ Transporting vesicles ⟶ Endoplasmic reticulum.

(b) Ribosomes ⟶ Transporting vesicles ⟶ Golgi body ⟶ Endoplasmic reticulum.

(c) Ribosomes ⟶ Endoplasmic reticulum ⟶ Transporting vesicles ⟶ Golgi body.

(d) Ribosomes ⟶ Endoplasmic reticulum ⟶ Golgi body ⟶ Transporting vesicles.

Answer the following questions (11 : 17) :

11 Indian fox and polar fox are from the same genus (*Canidae*), but each one of them lives in its own environment. **In the light of your study**, **explain why** the indian fox has no ability to live in the north pole.

12 "Cytoplasm contains the cell organelles only".

How far this statement is correct ? With explanation.

13 **What is the similarity between :** chromatin and thyroxine ?

14 **What is the relation between :** the type of lens used in the microscope and the magnifying power ?

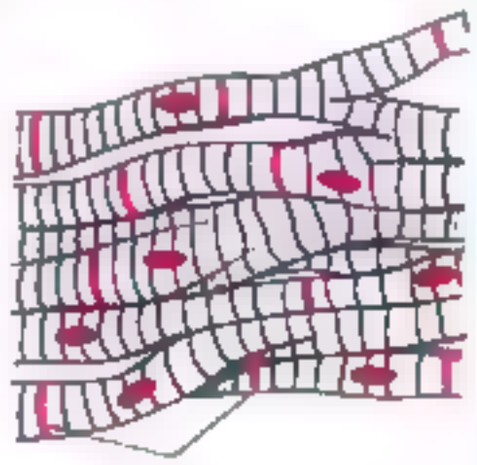
15 Inside the living cells, some substances are used and made benefit from them, **in the light of your study, answer :**

(a) **What** are the organelles that are responsible for the re-using process ?

(b) **How** are these organelles formed ?

16 Plants manufacture each of starch and cellulose. **Do** you expect that the enzymes which are participated in the formation of starch can be also used in the formation of cellulose ? **Explain your answer.**

17 **The opposite figure illustrates an important tissue in the human body, examine it, then answer the following :**


(A)

(a) **Where** is this tissue found ?

(b) **What happens if** the structure (A) is absent from this tissue ?

Model Exam 3

Choose the correct answer (1 : 10) :

1 If you know that the general formula of carbohydrates is $(CH_2O)_n$, and the chemical formula of glucose is $C_6H_{12}O_6$. So, (n) refers to .....

(a) the number of the water molecules that are found in sugar.

(b) the number of the atoms of internal elements that enter in the structure of sugar.

(b) the number of the chemical bonds among the atoms of elements.

(d) the number of (OH) groups between the carbon atoms.

2 The electron microscope is characterized by forming more accurate images than that of the light microscope, which of the following is considered the application for this characteristic ? .....

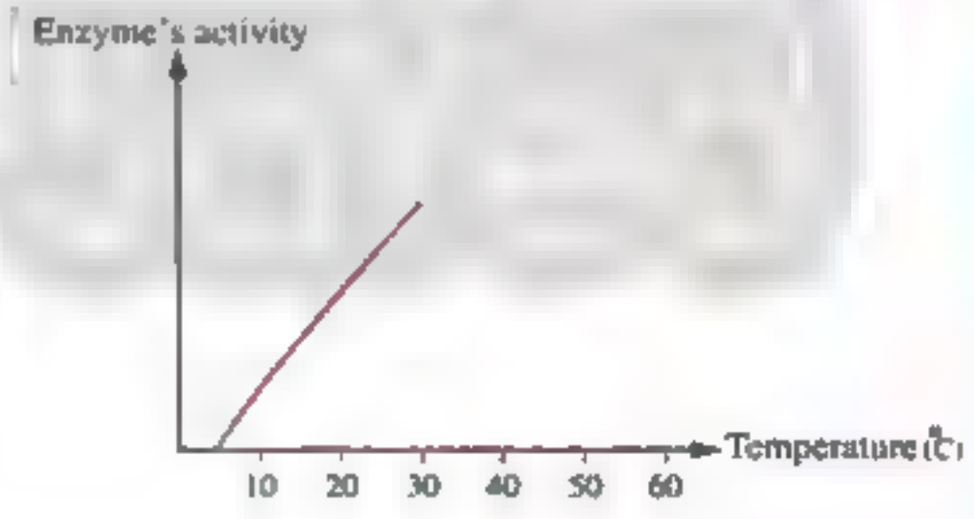
(a) Obtaining a bigger image for the cell.

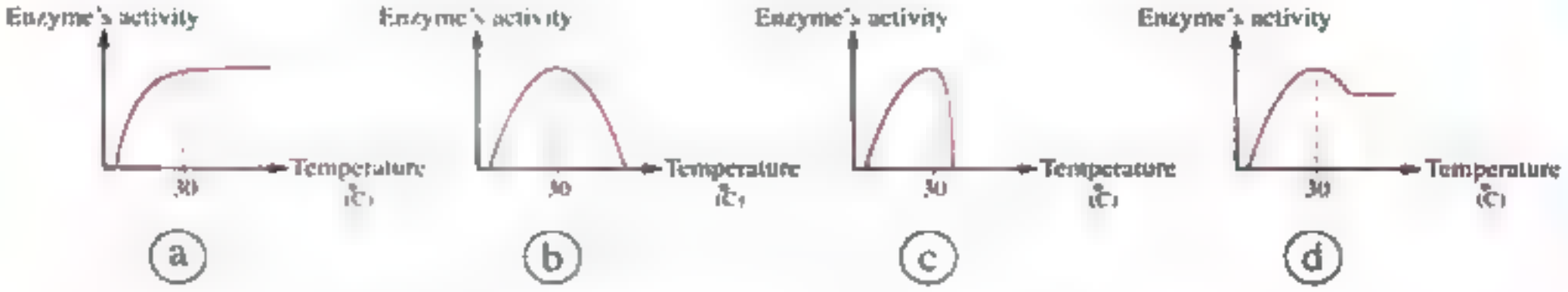
(b) The ability to see the cristae of the mitochondria.

(b) The ability to see the cell wall of a plant cell.

(d) The ability to see the nucleus in *Amoeba* cell.

3 In an experiment to study the effect of temperature on the activity of an enzyme in the body, a student added this enzyme on the substrate, providing the suitable conditions for its action, then he recorded the results as shown in the opposite graph, which graph may be obtained if the student raises the temperature up to 60°C suddenly ? .....





(a) (b) (c) (d)

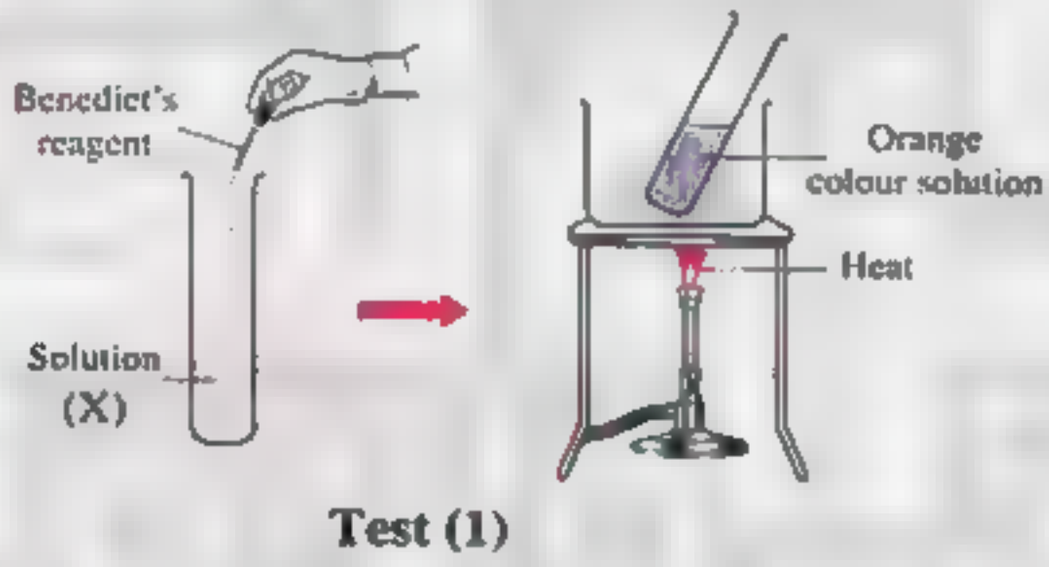
4 A researcher removed a component of the animal cell during the carrying out of one of his experiments, this leads to stopping all the vital processes in the cell after several hours. What do you expect this organelle to be ? .....

(a) Nucleus.
(b) Endoplasmic reticulum.
(c) Lysosome.
(d) Golgi apparatus.

5 The ability of the thyroid gland to build protein means that its cells contain ..... in abundance.

(a) amino acids and rough endoplasmic reticulum
(b) fatty acids and rough endoplasmic reticulum
(c) nucleotides and ribosomes
(d) amino acids and smooth endoplasmic reticulum

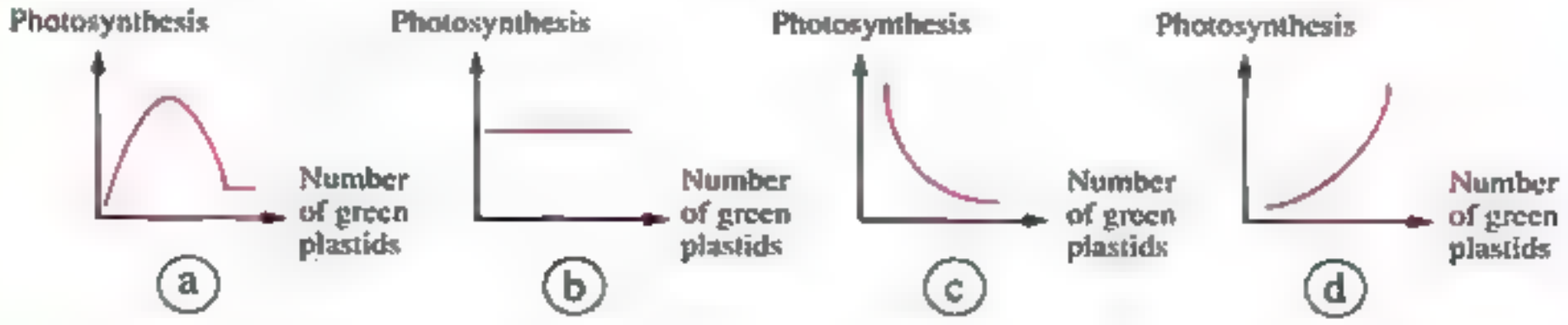
6 The two following figures represent two tests carried out on the solution (X), what are the food elements that are found in this solution ? .....



Test (1) Test (2)

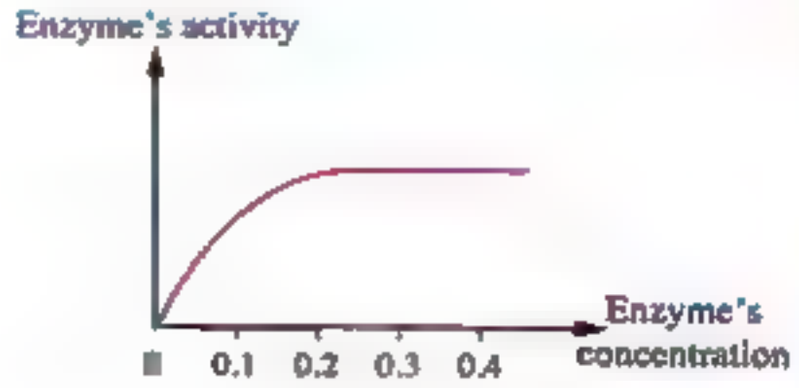
(a) Protein and starch.
(b) Glucose and protein.
(c) Starch and fats.
(d) Starch and glucose.

7 Which of the following graphs expresses the relation between the number of green plastids and the efficiency of the plant to do the photosynthesis process ? .....



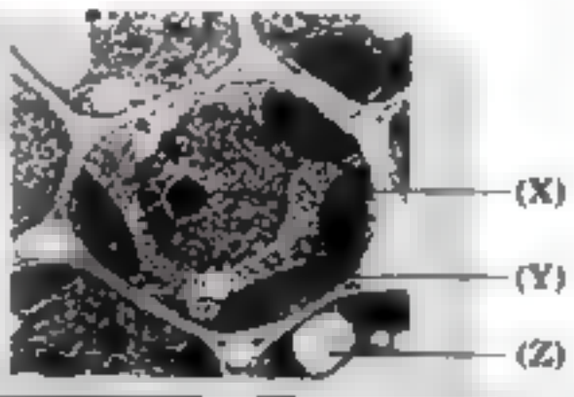
Model Exams

8 The opposite graph illustrates the relation between the activity of a certain enzyme and its concentration in the medium, when the concentration of the substrate increases, it is expected that the highest activity of this enzyme is at the concentration .....



(a) 0.1 (b) 0.2 (c) 0.3 (d) 0.4

9 What do the organelles (X), (Y) and (Z) contain ? .....



	(X)	(Y)	(Z)
(a)	Air	Chlorophyll	Protein
(b)	Mineral ions	Starch	DNA and RNA
(c)	Water	Mineral ions	Starch
(d)	DNA and RNA	Starch	Mineral ions

10 Which of the following choices links the cells with their function in a correct form ? .....

	Storage	Transport and support	Transport of O_2
(a)	Red blood cells	Xylem cells	Parenchyma cells
(b)	Parenchyma cells	Xylem cells	Red blood cells
(c)	Xylem cells	Sclerenchyma cells	Parenchyma cells
(d)	Parenchyma cells	Sclerenchyma cells	Red blood cells

Answer the following questions (11 : 17) :

11 **Give reason for :** the number of white blood cells increases when the human infects with influenza virus.

.....

.....

.....

.....

12 **What** are the structures that separate between the living cell contents and their surrounding environment ?

13 **What** is the number of carboxyl groups that are resulted from the binding of 15 amino acids in a polypeptide chain ?

14 Each of the nucleus and mitochondria is surrounded by a double membrane, but each one has its nature that helps in performing the vital functions of the cell. **Explain this.**

15 **Follow by arrows only** the route of insulin protein since its production, till its arriving to the target cell.

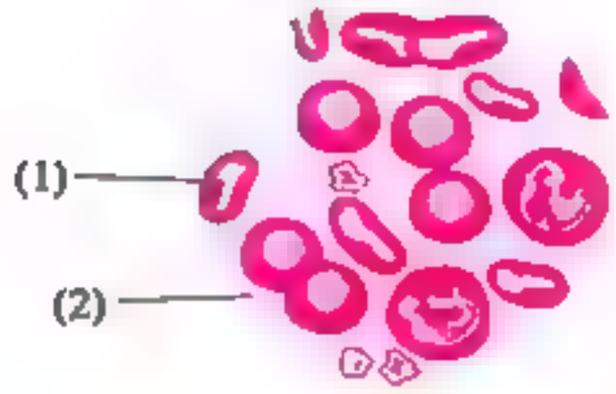
16 "The metabolic processes occur in the cells of the digestive system only".
How far this statement is correct ? With explanation.

17 **What happens if :** the waxy layer that covers the leaves of cactus plant is absent ?

Model Exam 4

Choose the correct answer (1 : 10) :

1 The opposite figure illustrates an important tissue in the human body, the structures (1) and (2) contain ..... respectively.



(a) albumin and haemoglobin
(b) albumin and thyroxine
(c) chromatin and thyroxine
(d) haemoglobin and albumin

2 The opposite figure illustrates an animal cell, which of the following its activity increases inside the cell after digesting a meal rich in carbohydrates ? .....

(a) (1). (b) (2).
(c) (1) and (4). (d) (2) and (3).

3 The following figure illustrates the enzyme action :

What does each of (W), (X) and (Y) represent in this chemical reaction ? .....

	Enzyme	Product	Substrate
(a)	W	X	Y
(b)	X	W	Y
(c)	X	Y	W
(d)	Y	W	X

4 The membrane that prevents the transfer of DNA into cytoplasm in the plant cell is the .....

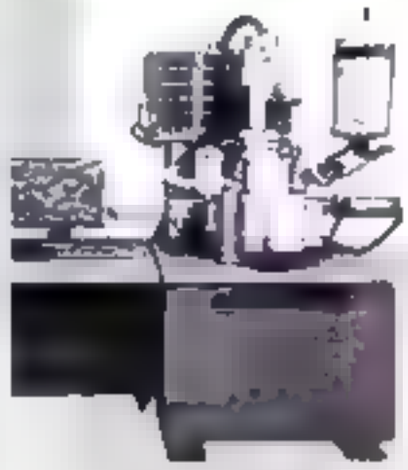
(a) plasma membrane. (b) cell wall.
(c) nuclear envelope. (d) sap vacuole membrane.

5 The opposite figure represents a primitive organism "*Euglena*", what is the microscope through which can be seen the accurate details for this organism ?.....

(a) 

(b) 

(c) 

(d) 

6 Which of the following molecules varies in its chemical composition greatly ? .....

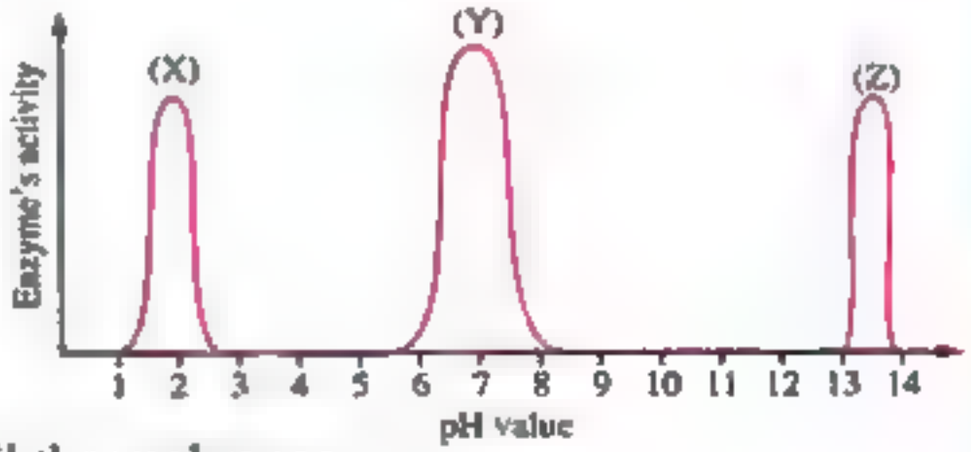
(a) Simple sugars. (b) Lipids.

(c) Nucleic acids. (d) Carbohydrates.

7 The food moves from the esophagus to the stomach by the action of .....

(a) enzymes. (b) water. (c) hormones. (d) mucus.

8 From the opposite graph that illustrates the relation between the activity of 3 enzymes (X), (Y) and (Z) and the pH value, we conclude that .....



(a) each enzyme works efficiently at pH value that differs from the other.

(b) each enzymes works efficiently in a small thermal range.

(c) three enzymes work efficiently in an acidic medium.

(d) three enzymes work efficiently in an alkaline medium.

Model Exams

9 Chimpanzee can climb the high trees, due to the contraction of ..... muscles.

(a) unstriated voluntary (b) unstriated involuntary

(c) striated involuntary (d) striated voluntary

10 Which of the following figures represents a cell in human liver ? .....

(a) (b) (c) (d)

Answer the following questions (11 : 17) :

11 A person wanted to get rid of the excess weight by following a certain diet. **What** types of food do you recommend to reduce from eating them ?

12 **What is the relation between** : the number of nucleoli in the cell and the formation of protein ?

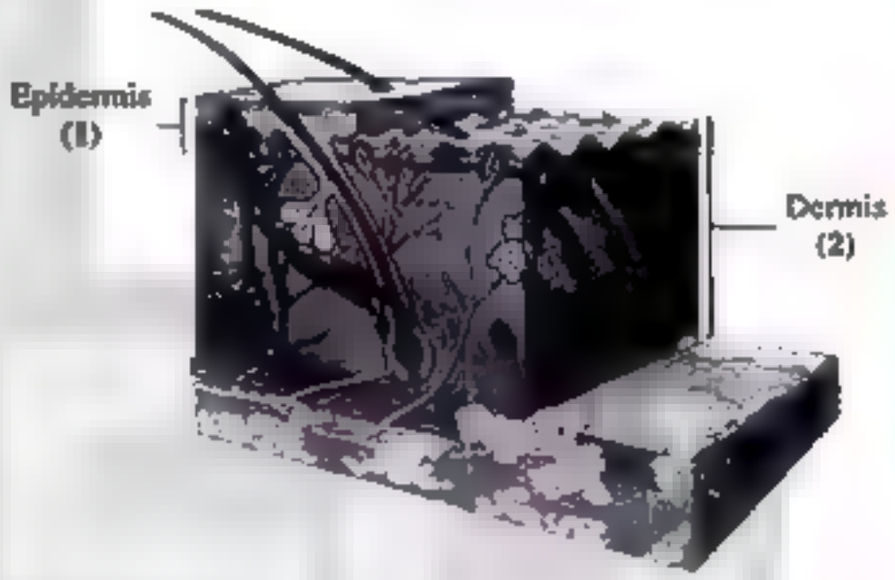
13 **Explain :** car maintenance worker resorts to use benzene for cleaning up his clothes.

14 On examining a tissue by using the microscope as shown in figure, it is found that the image is unclear. **Suggest two reasons for this.**

15 **Calculate :** the number of microtubules that form the centrosome in three liver cells.

16 Study the following diagram, then illustrate how far it is correct, with explanation :

17 The opposite figure represents a section in the skin, study it, then answer :



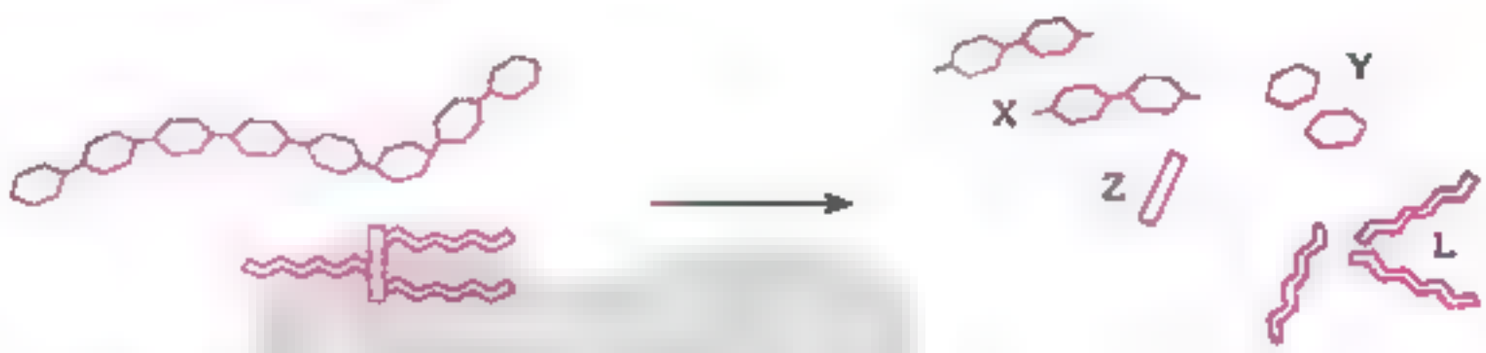
(a) Tissue no. (1) differs from tissue no. (2). Explain this.

(b) What is the importance of tissue no. (1) ?

Model Exam 5

Choose the correct answer (1 : 10) :

1 The following figure illustrates the molecules of two different food substances before and after the digestion by enzymes :

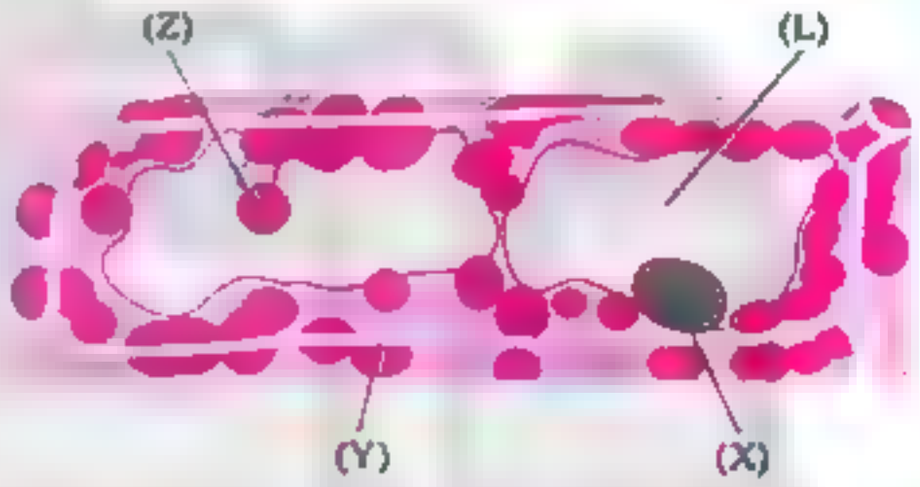


Which of the following represents the products of the digestion of fat substance ? .....

(a) (X) and (Y). (b) (Y) and (Z). (c) (X) and (L). (d) (Z) and (L).

2 The opposite figure illustrates a cell of a living organism that lives in pond and fresh swamp water. Which of the following refers to that is a plant cell ? .....

(a) (X) and (Y). (b) (Y) and (Z).
(c) (X) and (L). (d) (Y) and (L).



3 An experiment was carried out to know the effect of the pH value on the enzyme action, the results recorded on the opposite graph, determine from the following table what X and Y-axis represent .....

	X-axis	Y-axis
(a)	pH	Reaction speed
(b)	pH	Time
(c)	Reaction speed	pH
(d)	Time	pH

4 An animal cell whose nucleus was removed, however it was not damaged, then it was placed in a solution stimulating the cell division. So, it remained alive for a day, but it didn't divide and when comparing it with a healthy cell, it was found that it divided twice within this period, what do you conclude from this experiment about the role of the nucleus in the cell ? .....

(a) The nucleus controls the normal activity of the cell.

(b) The nucleus is necessary for the division process.

(c) The nucleus is necessary for the life.

(d) The nucleus is the only part in the cell that contains RNA

5 The following table illustrates the action of two different body muscles within a day, study it, then answer :

	First muscle	Second muscle
The number of muscle contraction times	Variable within the day hours.	Continue within the day hours.

The first muscle may be found in the .....

(a) heart. (b) leg. (c) wall of intestine. (d) mesentery.

6 Which of the following represents the elements and basic units that are used in the building of the biological macro-molecules ? .....

	Macro-molecules	Elements	Basic units
(a)	Lipids	Carbon, hydrogen, oxygen and nitrogen	Amino acid
(b)	Protein	Carbon, hydrogen, oxygen and nitrogen	Fatty acid
(c)	Starch	Carbon, hydrogen and oxygen	Glucose
(d)	Phospholipids	Carbon, hydrogen and oxygen	Fatty acid

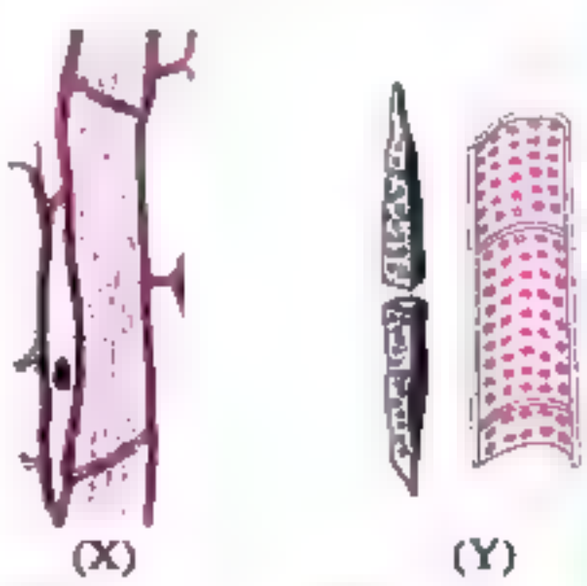
7 The structure (X) is similar to the structure (Y) in that both of them .....

(a) transfer food substances that are formed in leaves.

(b) transfer water and salts in one direction only.

(c) are thickened by lignin.

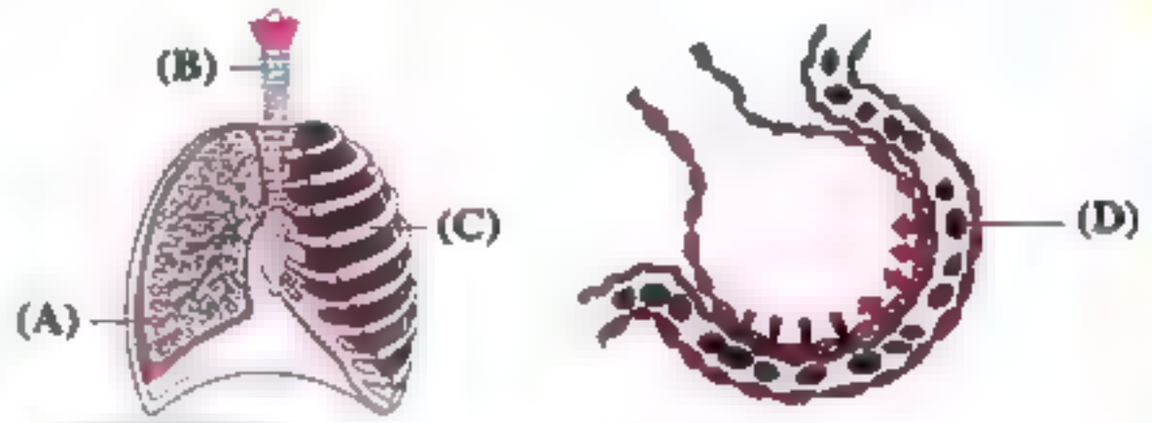
(d) are a vascular tissue.



8 Which of the following is not considered a source of energy in the cell ? .....

(a) Glucose. (b) Lactose. (c) Insulin. (d) Starch.

9 The two opposite figures illustrate the respiratory system in human and an alveolus surrounding by blood capillaries, which label represents a cell ? .....



(a) (A). (b) (B).

(c) (C). (d) (D).

10 Which of the following structures contains genes ? .....

(a) Plasma membrane of a certain plant cell.

(b) Cytoplasm of an animal cell.

(c) Nucleus of a plant cell.

(d) Lysosome in an animal cell.

Answer the following questions (11 : 17) :

11 **Give reason for :** the mitochondria are affected by lipid solvents.

12 **Give an example for :** an animal tissue whose formation is affected by a food mineral element **(in the light of your study).**

13 Nuclear envelope plays an important role in protein synthesis. **Explain this.**

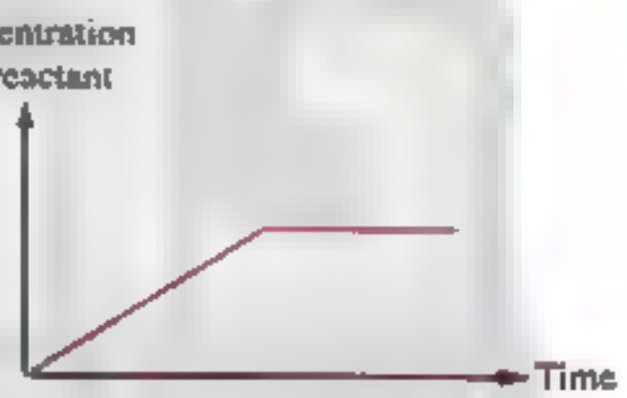
14 You have 3 carbohydrate compounds (A, ■ and C), if two compounds (A and B) are from the same group of substances, where compound (A) is a part of compound (B), and compound (C) is produced from the combination of several molecules from compound (A) :

(a) **Mention** the name of the compound (A).

(b) **Give an example for** the compound (C).

15 **What happens if :** the magnifying power of the objective lens in the light microscope is (100x) and the magnifying power of the ocular lens is (20x) ?

16 The opposite graph illustrates an enzymatic reaction. **How far** this graph is correct ?
With explanation.



17 **Write a similarity and a difference between :**
The organelles that are shown in the figure.

Model Exam 6

Choose the correct answer (1 : 10) :

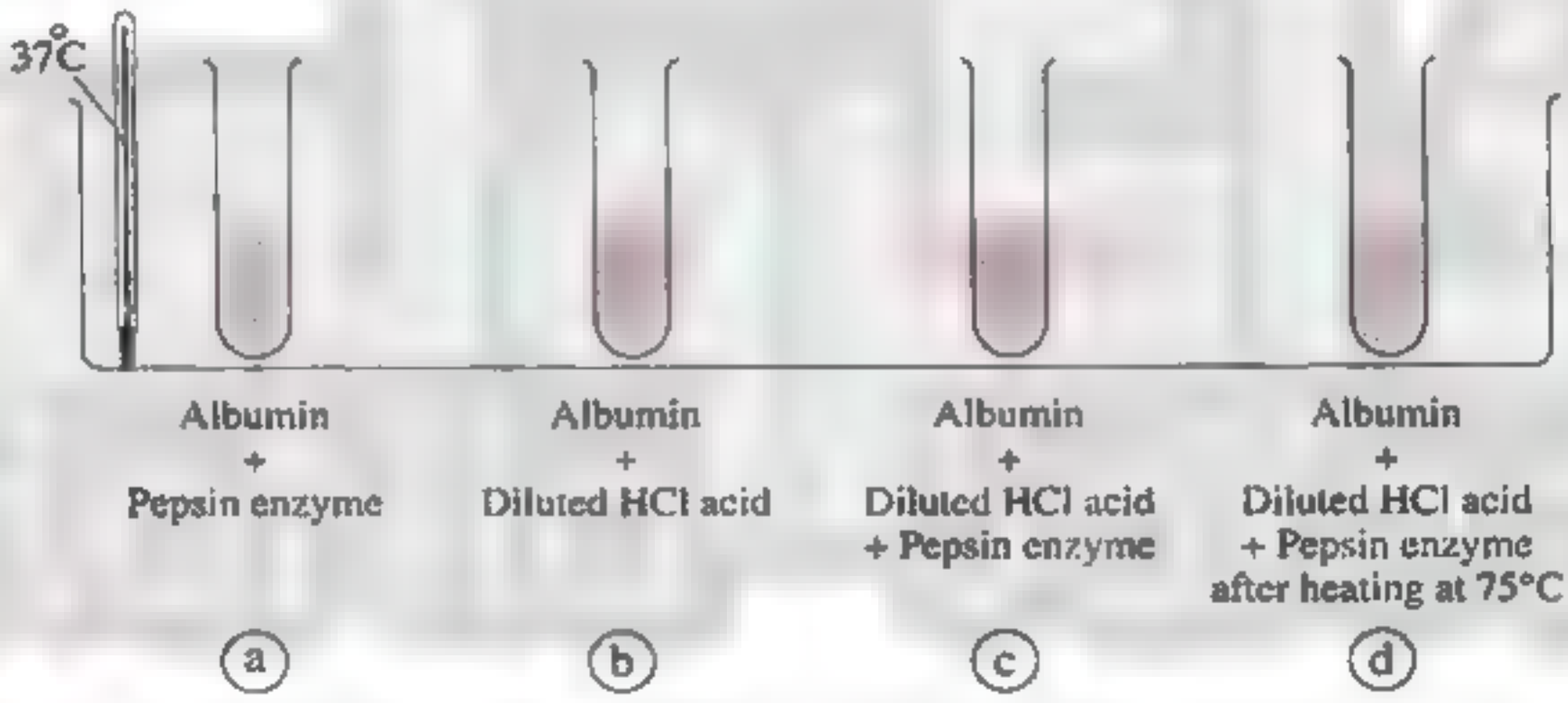
1 The organic molecules that consist of one fatty acid are .....

(a) fats. (b) waxes. (c) phospholipids. (d) oils.

2 All the following can be seen under the light microscope when examining a stained cell for an onion plant with magnifying power (400x), except the .....

(a) cell wall. (b) nucleus. (c) cytoplasm. (d) mitochondria.

3 The following figure illustrates an experiment of the digestion of albumin by pepsin enzyme that is extracted from the human stomach, in which test tube will protein be digested rapidly ? .....



4 Phagocytes are a type of white blood cells that engulf and digest the bacteria and debris cells, which of the following plays a role in the digestion of these substances ? .....

(a) Mitochondria.

(b) Lysosome.

(c) Centrosome.

(d) Rough endoplasmic reticulum.

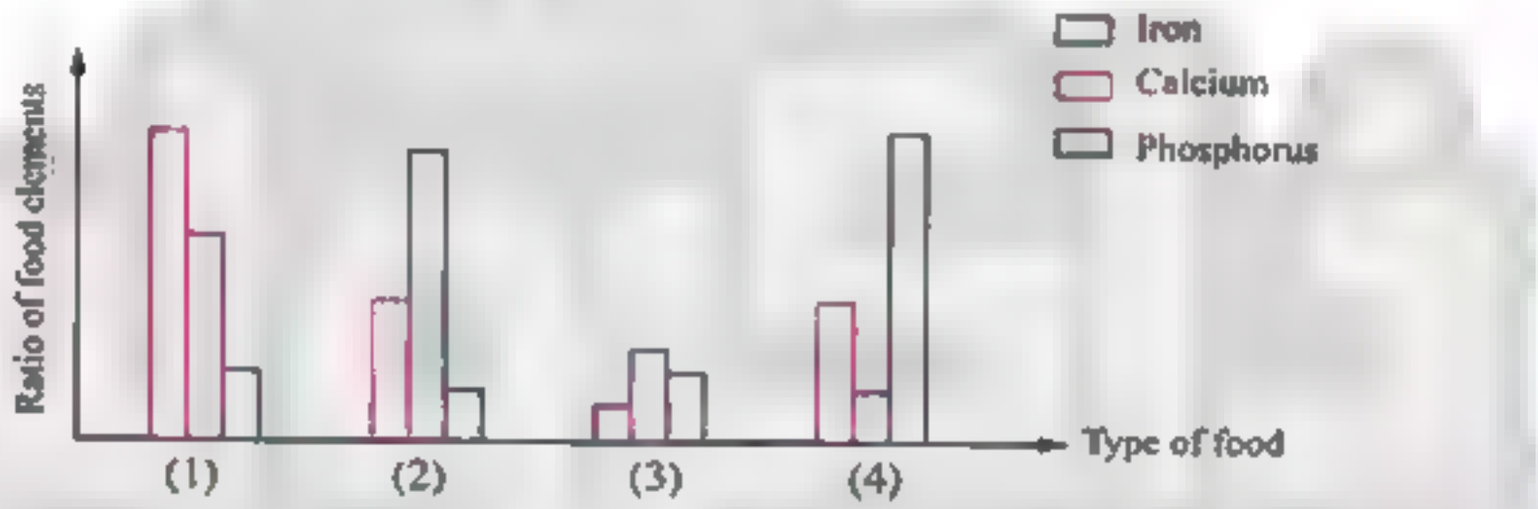
5 The scientist who could see the green scum by using a microscope with magnifying power may reach about 180 times of its real size is .....

(a) Virchow. (b) Robert Hooke.
(c) Van Leeuwenhoek. (d) Schwann.

6 Which of the following organic molecules contains the bonds (C = O) ? .....

(a) Amino acids and fatty acids.
(b) Amino acids and carbohydrates.
(c) Fatty acids and carbohydrates.
(d) Amino acids, fatty acids and carbohydrates.

The following figure illustrates the ratio of food elements in some types of different food, study it, then answer :



7 Which type of food participates in the treatment of osteomalacia in children ? .....

(a) (1). (b) (2). (c) (3). (d) (4).

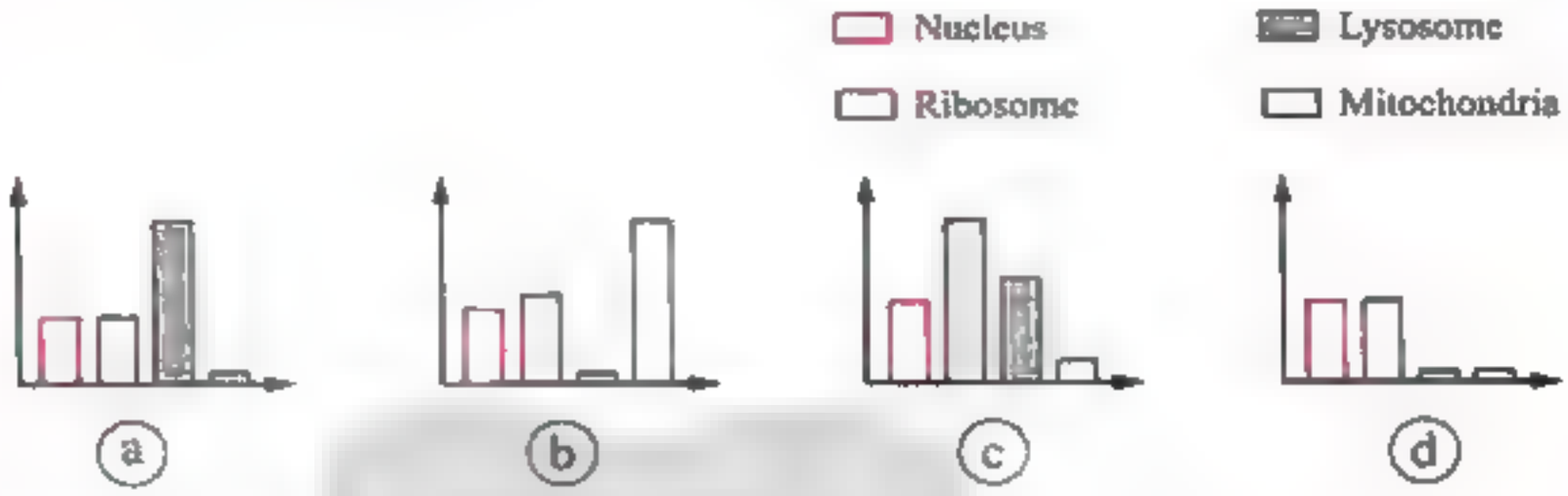
8 Which type of food is recommended by the doctors for the patients with anemia ? .....

(a) (1). (b) (2). (c) (3). (d) (4).

9 The opposite figure represents a muscle in .....

(a) the wall of the digestive canal.
(b) the wall of the heart.
(c) the human leg.
(d) the diaphragm of the respiratory system.

10 من The following graphs illustrate the components of 4 different animal cells, which cell contains a large amount of RNA ? .....



Answer the following questions (11 : 17) :

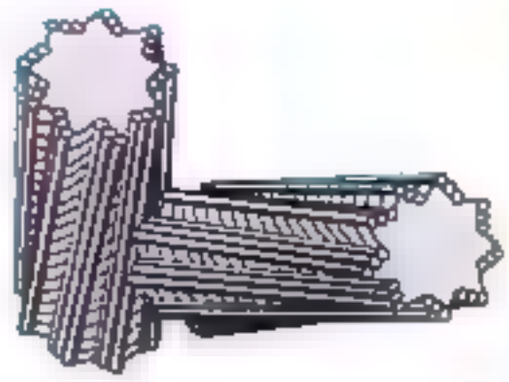
11 Using the dyes on examining the living specimens is considered double-edged sword, **explain this.**

12 **What happens if :** the internal leaves of cabbage is exposed to light ?

13 **What is the relation between :** Golgi apparatus and the elimination of the bacteria causing lung inflammation ?

14 من "Nerve cell has the ability to transmit the nerve impulses from the skin to the muscles directly". **How far this statement is correct ? With explanation.**

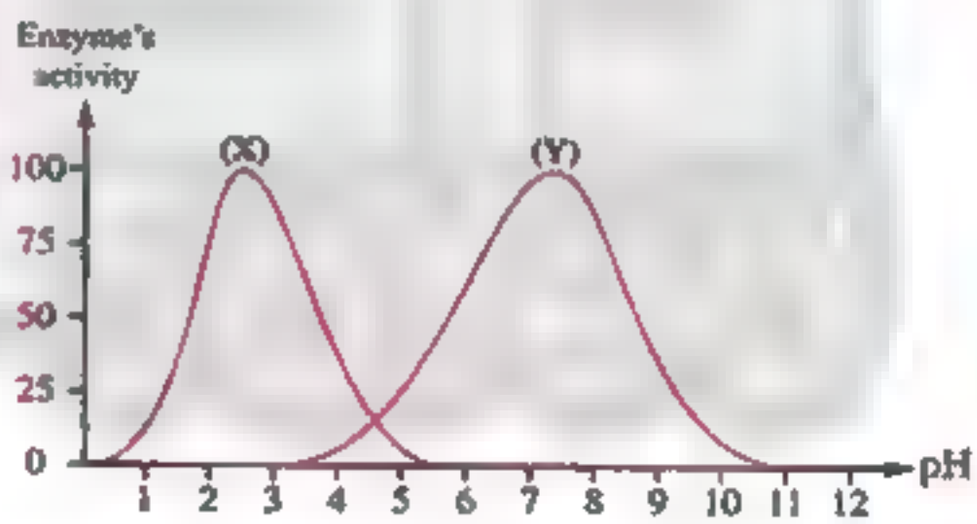
15 **In the opposite figure :**



What is the similarity between this organelle **and** the ribosomes ?

16 **What is the difference between : a muscle in the human finger and a muscle in the esophagus wall ?**

17 **The opposite graph illustrates the effect of pH on the activity of two enzymes (X) and (Y) which are extracted from the human digestive canal when digesting a food substance at temperature (37°C), study it, then answer :**



(a) What is the reason for carrying out this experiment at 37°C ?

(b) What is the effect of the increase of pH on the activity of enzyme (Y) ?

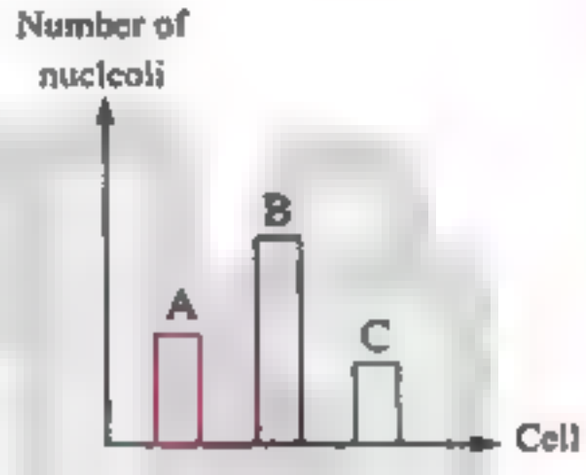
Model Exam 7

Choose the correct answer (1 : 10) :

1 The conversion of oil from the liquid state to the solid state by adding hydrogen is due to the conversion of the .....

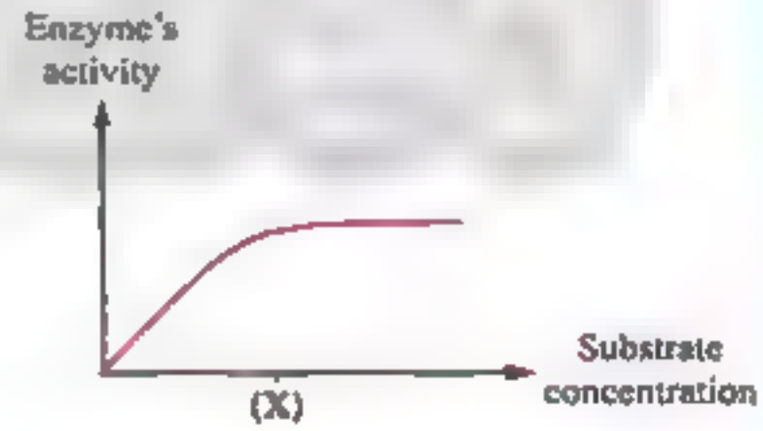
(a) chemical bonds among its atoms into ionic bonds.
(b) trihydric alcohol into monohydric alcohol.
(c) saturated fatty acids into unsaturated fatty acids.
(d) unsaturated fatty acids into saturated fatty acids.

2 The opposite graph represents a number of nucleoli of three different animal cells. Which of the following represents the cell (B) ? .....



(a) A cell of skin.
(b) A cell of stomach.
(c) A cell of leg bone.
(d) A cell of the muscles.

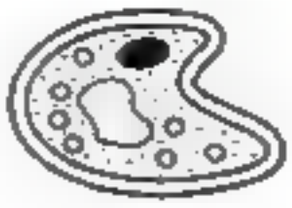
3 From the opposite graph that illustrates the effect of the substrate concentration on the activity of enzyme that is extracted from the human digestive canal, the activity of enzyme doesn't increase after the concentration (X), is due to .....



(a) the change of the optimal pH of the medium in which the enzyme works.
(b) the consumption of all molecules of the substrate.
(c) the consumption of all molecules of the enzyme.
(d) the arrival of temperature to 55°C.

4 The following figures illustrate 6 cells, which of the following are plant cells and which of them are animal cells ? .....

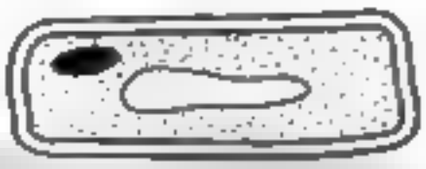
(1)



(2)

(3)

(4)



(5)

(6)

	Plant cells	Animal cells
a	(2), (3) & (4)	(1), (5) & (6)
b	(1), (3), (5) & (6)	(2) & (4)
c	(2) & (5)	(1), (3), (4) & (6)
d	(1), (4) & (6)	(2), (3) & (5)

5 The living cell needs to some mineral ions as calcium. Through which of the following will the calcium pass into the cell ? .....

(a) The heads of phospholipids.
(b) The tails of phospholipids.
(c) Cholesterol molecules.
(d) Protein molecules.

6 On placing a living cell of the human liver in a nutritive medium containing a radioactive phosphorus isotope (P^{32}), which of the following molecules in the cell contains this radioactive isotope ? .....

(a) Glycogen.
(b) Albumin protein.
(c) DNA
(d) Glucose.

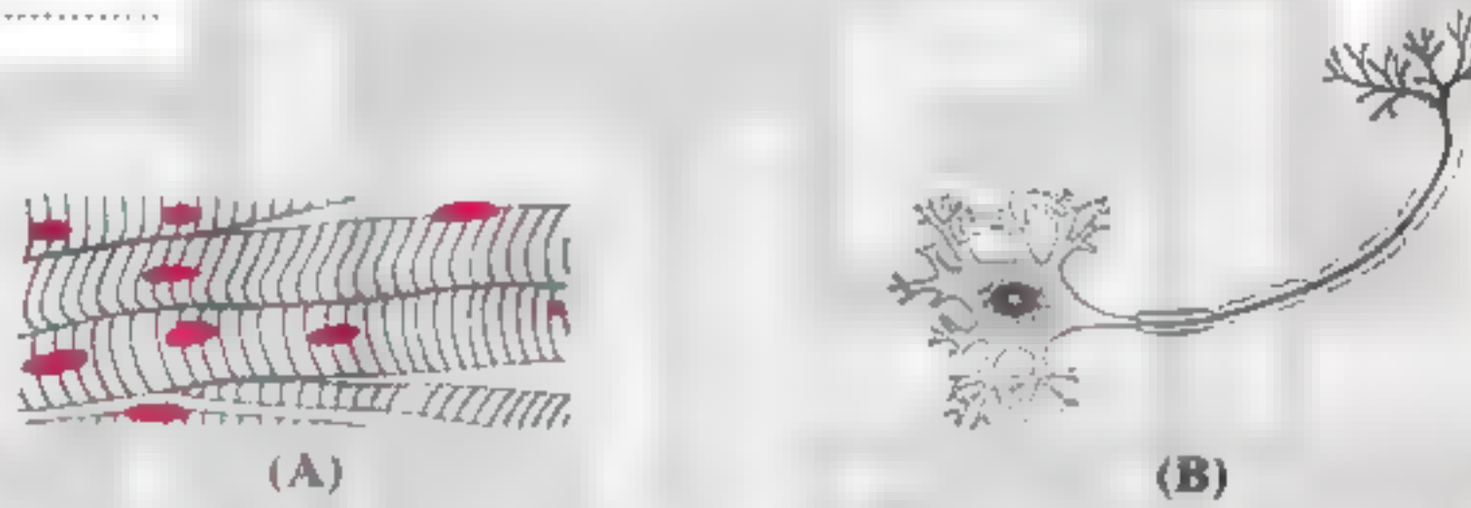
7 A student examined a transverse section in a herbaceous plant stem, he found that it contained a tissue whose cells are rectangular in shape and thickened by cellulose substance and also contained chloroplasts, according to the student's observation, we conclude that this tissue acts on .....

(a) supporting the plant and storage of starch.
(b) supporting the plant and performing the photosynthesis process.
(c) the aeration for the plant and storage of starch.
(d) the aeration and performing the photosynthesis.

8 If you know that when two molecules of monosaccharides are linked together, a molecule of water is removed. What is the number of water molecules produced on the formation of 5 maltose molecules ? .....

(a) 9 (b) 5 (c) 4 (d) 1

9 In the two following figures, cell (B) stimulates cells (A) to contract, this process is benefit in .....

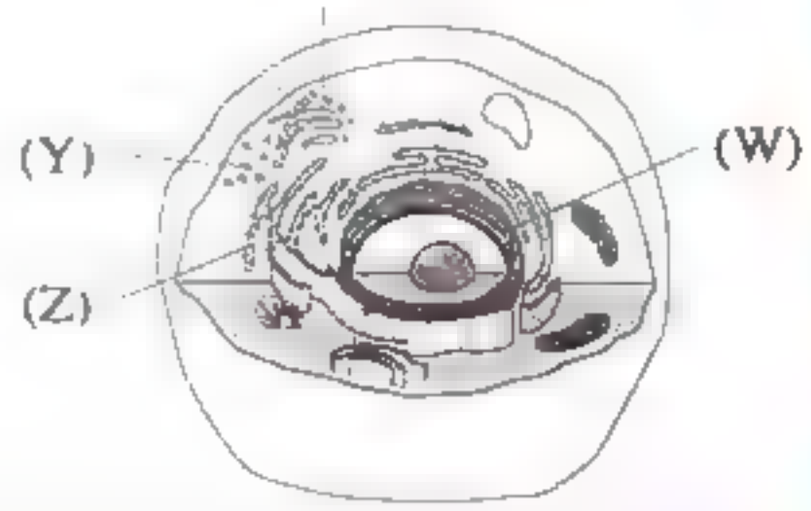


(A) (B)

(a) the movement of food inside the digestive canal.
(b) the pumping of blood from the heart in the blood vessels.
(c) the raising up of a book on the office.
(d) the secretion of milk outside the breast.

10 Which of the structures illustrated in this figure is produced by the organelle that is responsible for the aggregation of the proteins and insertion of some changes on them ? .....

(a) (W). (b) (X).
(c) (Y). (d) (Z).



Answer the following questions (11 : 17) :

11 There is a nitrogen element in each of proteins and nucleic acids, **explain this.**

12 **What is the similarity between :** the tissue that lines the blood capillaries and the tissue that lines the stomach ?

13 **Compare between :** what happens in muscles during exercises **and** after some hours of eating a meal rich in carbohydrates **(in the light of your study of the metabolism).**

14 **Give reason for :** the number of cristae of the mitochondria increases in the cells of birds muscles.

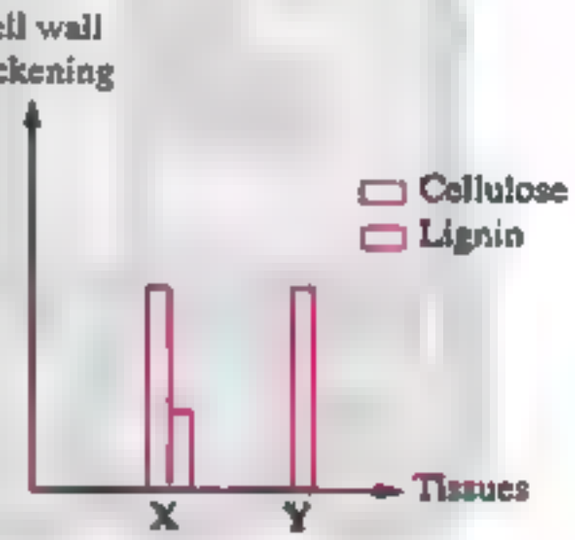
Model Exams

15 **What is the relation between :** the cytoplasm and supporting the cell ?

16 **From the following diagram :**

If (X) is a sugar that gives a positive result with Benedict's reagent, (Z) is present in the baby milk. **What does each of (X and Z) represent ?**

17 **The opposite graph illustrates the thickening of the cell walls in two types of cells that are found in the plant tissues (X) and (Y), study it, then answer :**



What is the difference between the two tissues (X) and (Y) ?

Model Exam 8

Choose the correct answer (1 : 10) :

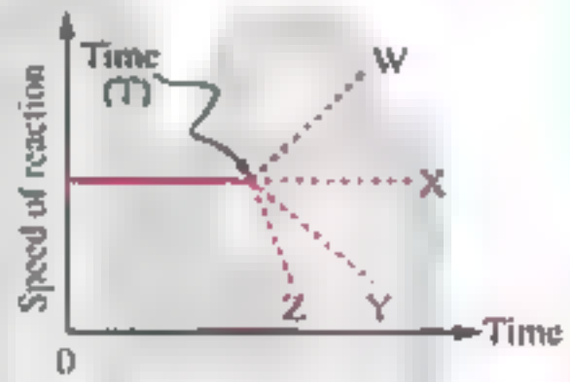
1 The ability of the wax covering plant leaves to decrease the water loss, because .....

(a) it contains monohydric alcohols.
(b) it is from the organic compounds.
(c) it is from the macro-molecules.
(d) it contains fatty acids.

2 The plant cell loses its ability to divide in case of the absence of .....

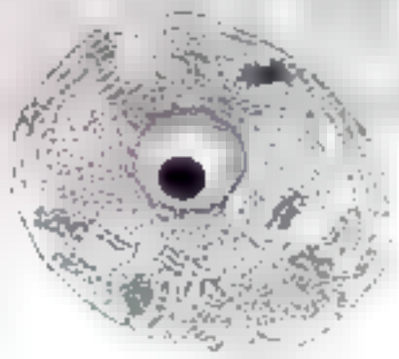
(a) ribosomes.
(b) centrosome.
(c) dictyosome.
(d) some cytoplasmic genes.

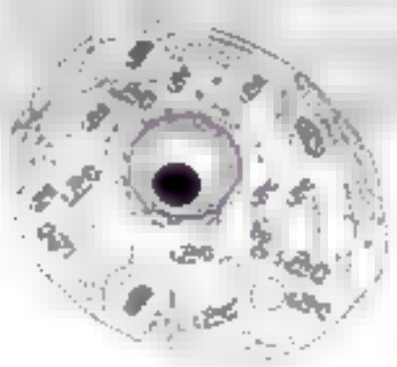
3 Which of the lines illustrated in the opposite graph expresses an enzymatic reaction inside the stomach, if the hydrogen ion concentration (pH) of the stomach decreases from 4 to 2 at time (T) ? .....

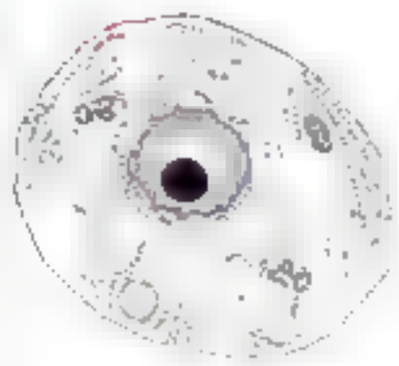


(a) W
(b) X
(c) Y
(d) Z

4 Which of the following cells can produce a large amount of lipase enzyme ? .....


(a)


(b)

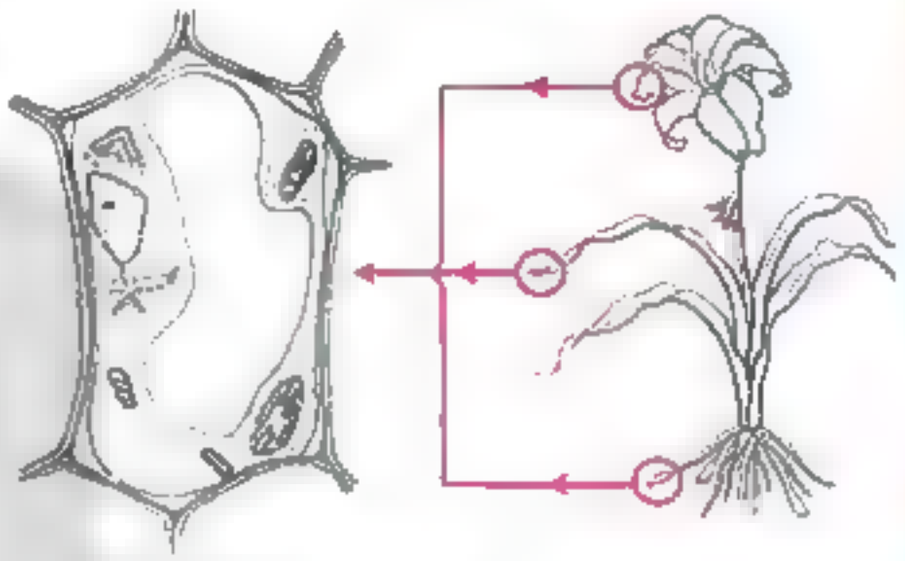

(c)


(d)

5 The opposite figure illustrates a nucleotide in ■ nucleic acid. The chemical formula of the structure (S) is .....

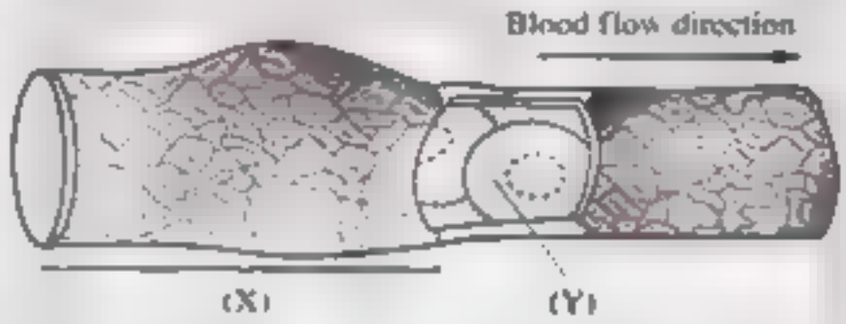
(a) $C_6H_{12}O_6$ (b) $C_5H_{10}O_4$
(c) $C_5H_{10}O_5$ (d) $C_{12}H_{22}O_{11}$

6 The two opposite figures illustrate a principle upon which the cell theory depends, who is the scientist stated this principle ? .....



(a) Schwann.
(b) Virchow.
(c) Schleiden.
(d) Van Leeuwenhoek.

7 The following figure illustrates the blood flow through an artery :



Which of the following illustrates the structure of each of (X) and (Y) ? .....

	(X)	(Y)
(a)	Simple tissue	Cell
(b)	Organ	Simple tissue
(c)	Compound tissue	Cell
(d)	Compound tissue	Simple tissue

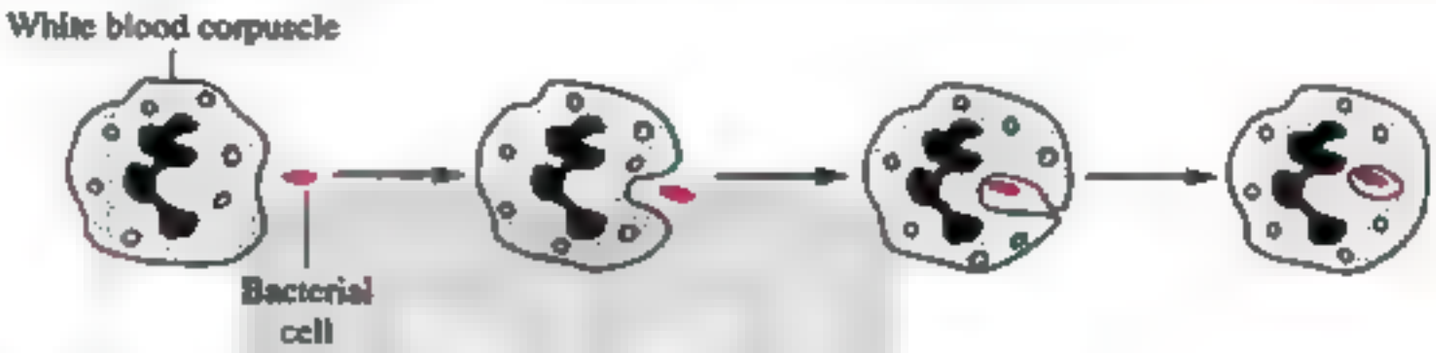
8 Which of the following statements is correct about the unsaturated fats ? .....

(a) They are more common in animals than plants.
(b) They are more common in plants than animals.
(c) They are solid at the room temperature.
(d) Monohydric alcohols enter in their structure.

9 The opposite figure illustrates some cells that may be present in the .....

(a) digestive canal.
(b) blood.
(c) the lining of the kidney tubules.
(d) stomach wall.

10 What is the next step of the process that is illustrated in the following figure ? .....



(a) Inserting water molecules into the cell.
(b) Expelling out of bacteria that are engulfed outside the cell.
(c) Fusing the lysosome with the vesicle containing bacteria.
(d) Fusing the vesicle containing bacteria with the cell membrane.

Answer the following questions (11 : 17) :

11 "Monosaccharides have the same molecular weight".
How far this statement is correct ? With explanation.

12 **What is the relation between :** the formation of carbohydrates and plastids inside the plant cell ?

13 Some types of plant tissues are similar with each other in the function, **explain this.**

Model Exams

14 **What** is the number of the microtubules that the centrosome formed of in 3 neurons in human ?

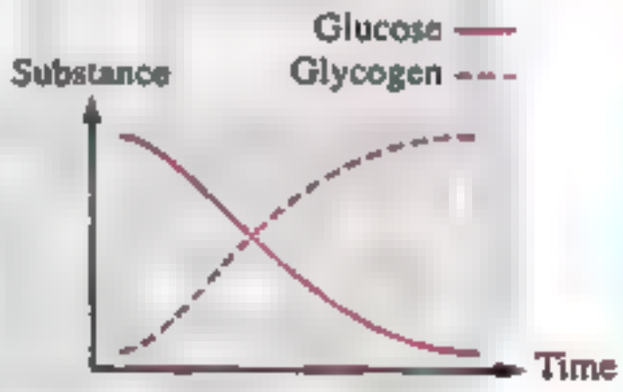
15 **The following figures illustrate some digestive processes :**

(1)	(2)	(3)	(4)
pH = 7.5 Temperature (37°C)	pH = 9 Temperature (35°C)	pH = 8 Temperature (25°C)	pH = 2 Temperature (20°C)

Which of the previous digestive processes works better after adding amylase enzyme to each one of them ? **And why ?**

16 **The opposite graph illustrates a vital process that occurs in a part of the cell, study it, then determine :**

What is the organelle that is responsible for the occurrence of this vital process ?



17 **The two following figures illustrate two tissues in the human body, study them, then answer :**

(1) (2)

Give an example for a site for each type.

Model Exam 9

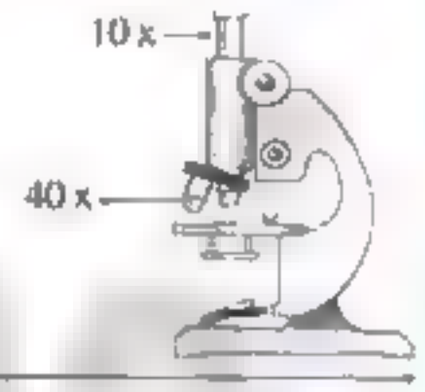
Choose the correct answer (1 : 10) :

1 On chewing a piece of bread for some seconds, we found that its taste is sweet.
From the previous, we can conclude that the saliva in mouth contains an enzyme that hydrolyzes .....

(a) starch to glycogen.
(b) glycogen to starch.
(c) starch to cellulose.
(d) starch to maltose.

2 The opposite figure illustrates the light microscope, the magnifying power of this microscope is .....

(a) 40x
(b) 100x
(c) 400x
(d) 4000x



3 In an experiment, it was added a substrate (S) in a conical to equal amounts of the enzymes (E_1, E_2, E_3, E_4, E_5, E_6 & E_7), where the following diagram illustrates the pathway of this reaction :

After 15 minutes from the beginning of the reaction, it was added an inhibitor for the enzyme (E_3) and the reaction was left till its ending, which result do you expect to happen ? .....

(a) Decreasing the rate of the production of (U) substance.
(b) Increasing the rate of the production of (Z) substance.
(c) No effect on the rate of the production of (Y) substance.
(d) Increasing the rate of the production of (V) substance.

4 The cell dies on removing each of the following, except the .....

(a) nucleus.
(b) cell wall.
(c) cell membrane.
(d) ribosomes.

Model Exams

5 The microscope that is used to see the cell in this figure is .....

(a) simple microscope.
(b) compound light microscope.
(c) transmission electron microscope.
(d) scanning electron microscope.

6 To form a chain of polypeptide from 3 different amino acids linked together several times with varied arrangements. So, the maximum number of the types of formed polypeptide chains is .....

(a) one chain. (b) two chains.
(c) three chains. (d) six chains.

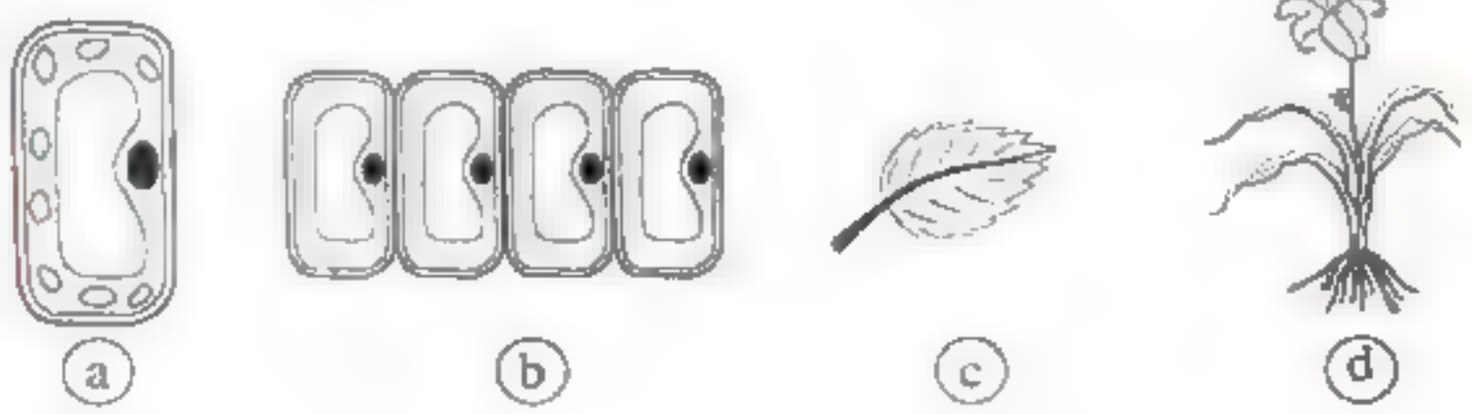
7 Companion cells and parenchyma cells share in that both of them contain .....

(a) plastids. (b) centrosome.
(c) protoplasm. (d) lignin.

8 Which of the following represents the correct arrangement for the components of a multicellular living organism from the simplest to the most complex ? .....

(a) Cells – Polymers – Organelles – Tissues.
(b) Polymers – Cells – Organelles – Tissues.
(c) Organelles – Polymers – Cells – Tissues.
(d) Polymers – Organelles – Cells – Tissues.

9 Which of the following represents an organ ? .....



(a) (b) (c) (d)

10 Which of the following molecules doesn't move freely through the phospholipids of plasma membrane ? .....

(a) Water molecules only.
(b) Protein molecules only.
(c) Water molecules and oxygen.
(d) Protein molecules and oxygen.

Answer the following questions (11 : 17) :

11 **From the following diagram :**

Compound (X) + Compound (Y) ⟶ Compound (Z)

If (Z) is a compound present in the body of penguin and helps it in keeping its temperature in the severe cold regions. **Conclude what each of the biological compounds (X) and (Y) represents.**

12 Cell wall in the plant cell acts on protecting, supporting and acquiring it its characteristic shape, **what is the structure that performs the same function in the animal cell ?**

13 **What is the relation between :** the iodine element and the thyroxine ?

14 "Some plants live immersed completely in water as *Elodea* plant". **In the light of your study, conclude two examples** for the plant tissues that are rare in these plants to adapt with the aquatic environment.

15 **Cellular division process is the most important vital process in a cell of the living organism :**

(a) **What** are the changes that are occurred in the cell during this process ?

(b) **What** is the role of the cell organelles that share in this process ?

16 Photosynthesis process and cellular respiration in the plant depends on each other. **Explain this.**

17 Study the two opposite figures, then **determine the similarity between them.**

(1) (2)

Model Exam 10

Choose the correct answer (1 : 10) :

1 If you know that the binding of two molecules of glucose in which the removal of a water molecule takes place, the molecular formula of the polymer that consists of four molecules of glucose is .....

(a) $C_{24}H_{48}O_{24}$ (b) $C_{24}H_{44}O_{22}$ (c) $C_{24}H_{42}O_{21}$ (d) $C_{18}H_{30}O_{15}$

2 Which of the following statements expresses the optimal temperature for all enzymes ? .....

1. The temperature at which the enzyme works efficiently.
2. The highest temperature at which the enzyme works.
3. It ranges between (35°C to 37°C).

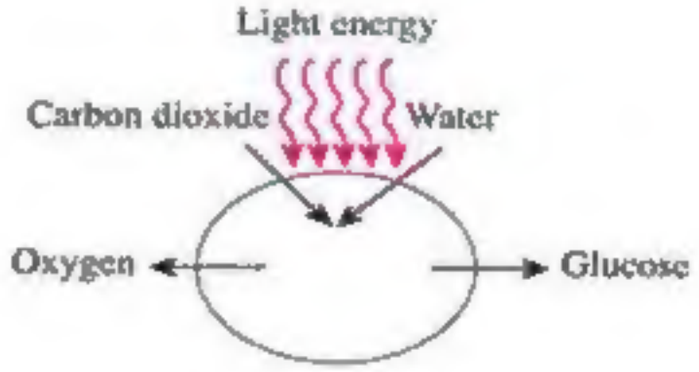
(a) (1), (2) and (3). (b) (1) and (2) only.
(c) (1) only. (d) (3) only.

3 The opposite table illustrates four test tubes that contain equal amounts of starch with the salivary enzyme, in which test tube is the starch hydrolyzed rapidly ? .....

	Temperature	pH
(a)	27	2
(b)	37	2
(c)	27	7
(d)	37	7

4 The opposite figure represents a vital process that occurs in the .....

(a) mitochondria.
(b) chloroplast.
(c) Golgi body.
(d) leucoplast.



5 During the division of the white blood cells, we can see ..... by the light microscope.

(a) two centrioles

(b) chromosomes

(c) cells with different nuclei

(d) the structure of the plasma membrane

6 To form a chain of polypeptide from 3 similar amino acids linked together several times with varied arrangements. So, the maximum number of the types of formed polypeptide chains is .....

(a) one chain. (b) two chains.

(c) three chains. (d) six chains.

7 Which of the following tissues represents some components of the vascular connective tissue ? .....

Tissue	Mitochondria	Ribosomes	Lysosomes
(X)	70%	10%	20%
(Y)	40%	30%	30%
(Z)	20%	70%	10%
(L)	20%	10%	70%

(a) (X). (b) (Y). (c) (Z). (d) (L).

8 Which of the following is correct about the formation of starch from monosaccharides ? .....

(a) It is consumed energy in it.

(b) It is required to form peptide bonds.

(c) The reaction occurs only in animal cells.

(d) The chemical bonds of monosaccharides are broken.

9 Phloem tissue contains sieve tubes and companion cells, the sieve tubes supply the companion cells with the required energy to transport the food substances resulted from the photosynthesis process from the leaves to all the plant parts, ...

(a) the two statements are correct.

(b) the first statement is correct and the second statement is wrong.

(c) the first statement is wrong and the second statement is correct.

(d) the two statements are wrong.

10 Each of centrosome, centriole and centromere .....

(a) consists of two molecules.

(b) is present in the centre of an organelle of the cell organelles.

(c) is present in the brain cells.

(d) is related to the cell division.

Answer the following questions (11 : 17) :

11 Muscular cells contain a greater number of mitochondria than the other types in the animal cells, **conclude the importance of the mitochondria for the muscular cells.**

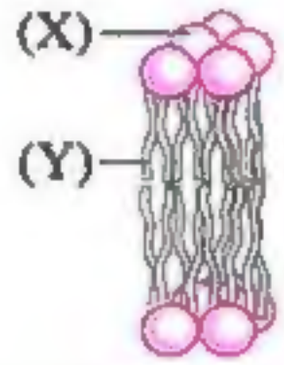
12 **What happens if :** a child eats meals poor in calcium element "according to the growth process" ?

13 **What is the similarity between :** galactose sugar and lactose sugar ?

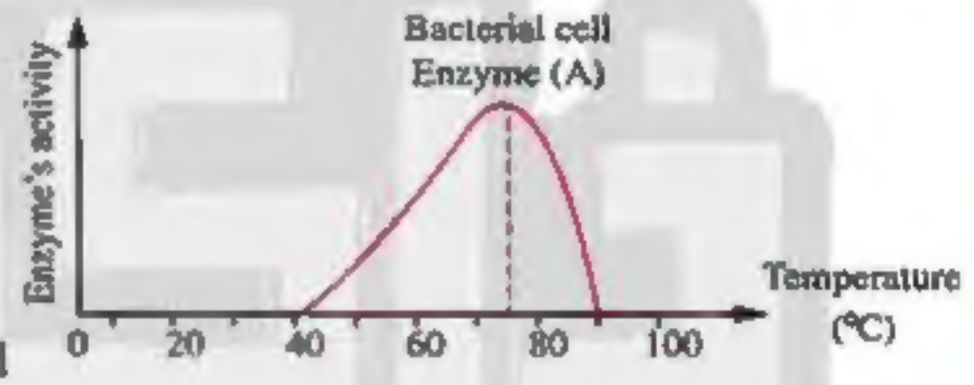
Model Exams

14 Simple microscope of Van Leeuwenhoek differs from the simple microscope of Robert Hooke. **Explain this.**

15 The opposite figure represents a part of the plasma membrane, **can** the part (X) replace the part (Y) ? **Explain your answer.**



16 The opposite figure illustrates the effect of the temperature on the activity of enzyme (A) in a type of bacteria that stimulates the formation of a poisonous substance for human, **what happens if** a person eats a food containing these bacteria ?
Explain your answer.



17 "Endoplasmic reticulum represents a communication system among the different organs in the human body". **How far this statement is correct ? With explanation.**